

YAMAHA NETWORK BOARD RCX series

CC-Link

User's Manual

ENGLISH 

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Introduction

Thank you for purchasing the CC-Link compatible module. This CC-Link compatible module is an option module that enables connection of the YAMAHA robot controller RCX series as a CC-Link system remote device station. The CC-Link compatible module with  label is compatible with CC-Link Ver.1.10. CC-Link compatible modules without the CC-Link label are compatible with Ver.1.00. The robot controller explained in this manual refers to the RCX series. This manual describes the flow of operations from wiring the CC-Link compatible module to programming, and includes setting examples.

For details on other devices such as connecting the master station PLC and PLC programming, refer to the manual for the respective product. Refer to the controller user's manual and programming manual supplied with the YAMAHA robot controller for details on operating the robot controller and on the robot program.

Applicable controllers: RCX240, RCX141, RCX142, RCX40, RCX221 and RCX222

Model names as used in this manual include the following controllers.

RCX240:	Includes RCX240, RCX141, RCX142 and RCX40 (4-axis controllers)
RCX14x:	Includes RCX141, RCX142 and RCX40 (4-axis controllers excluding RCX240)*
RCX22x:	Includes RCX221 and RCX222 (2-axis controllers)

* Here, "RCX14x" does not include RCX240 and is used when there is a difference between the RCX240 and other 4-axis controllers due to differences in software versions.

Safety Precautions (Always read before starting use)

Always read this manual, the robot controller user's manual and programming manual before using this product. Take special care to safety, and correctly handle the product. The cautions given in this manual are related to this product. Refer to the robot controller user's manual for details on the cautions to be taken with the robot controller system using this product.

* The safety precautions are ranked as "WARNING" and "CAUTION" in this manual.



WARNING

FAILURE TO FOLLOW WARNING INSTRUCTIONS COULD RESULT IN SERIOUS INJURY OR DEATH TO THE OPERATOR OR PERSON SERVICING THE PRODUCT.



CAUTION

Failure to follow CAUTION instructions may result in injury to the operator or person servicing product, or damage to the product or peripheral equipment.



NOTE

Explains the key point in the operation in a simple and clear manner.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained. Store this manual where it can be easily referred to, and make sure that it is delivered to the end user.

CC-Link is a registered trademark of CC-Link partner association.

The CC-Link compatible module provided with a  label is compatible with CC-Link Ver.1.10.

[Precautions for design]**WARNING**

- REFER TO THE CC-LINK SYSTEM MASTER MODULE USER'S MANUAL AND THIS MANUAL FOR DETAILS ON THE STATE OF THE CC-LINK SYSTEM AND ROBOT CONTROLLER WHEN A COMMUNICATION ERROR OCCURS WITH THE CC-LINK SYSTEM, ETC.
CONFIGURE AN INTERLOCK CIRCUIT IN THE SEQUENCE PROGRAM SO THAT THE SYSTEM, INCLUDING THE ROBOT CONTROLLER WILL WORK SAFELY USING THE COMMUNICATION STATUS INFORMATION.
- THE SAFETY CONNECTOR OF THE ROBOT CONTROLLER HAS AN EMERGENCY STOP TERMINAL TO TRIGGER EMERGENCY STOP. USING THIS TERMINAL, PREPARE A PHYSICAL INTERLOCK CIRCUIT SO THAT THE SYSTEM INCLUDING THE ROBOT CONTROLLER WILL WORK SAFETY.

**CAUTION**

- The control line and communication cable must not be bound with or placed near the main circuit or power line. Separate these by at least 100mm. Failure to observe this could lead to malfunctions caused by noise.
- The dedicated input of STD.DIO connector provided on the RCX240 controllers will be disabled except for an interlock signal (DI 11). When the Board condition (external 24V monitor control) of system parameters is set invalid, the interlock signal (DI 11) will also be disabled. On the RCX22x, the dedicated input of STD.DIO connector will be disabled, but the interlock signal (DI 11) in SAFETY connector enabled.

[Precautions for installation]**WARNING**

- ALWAYS CRIMP, PRESS-FIT OR SOLDER THE CONNECTOR WIRE CONNECTIONS WITH THE MAKER-DESIGNATED TOOL, AND SECURELY CONNECT THE CONNECTOR TO THE MODULE.
- ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE STARTING INSTALLATION OR WIRING WORK.
FAILURE TO SHUT OFF ALL PHASES COULD LEAD TO ELECTRIC SHOCKS OR PRODUCT DAMAGE.

**CAUTION**

- Use the robot controller within the environment specifications given in the manual. Use in an environment outside the environment specification range could lead to electric shocks, fires, malfunctioning, product damage or deterioration.
- Install the CC-Link compatible module into the robot controller, and securely fix with screws.
- Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.
- Never directly touch the conductive sections or electric parts inside the controller.
- Accurately connect each connection cable connector to the mounting section. Failure to observe this could lead to malfunctions caused by a connection fault.

[Precautions for wiring]**WARNING**

- ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE STARTING INSTALLATION OR WIRING WORK. FAILURE TO SHUT OFF ALL PHASES COULD LEAD TO ELECTRIC SHOCKS OR PRODUCT DAMAGE.
- ALWAYS INSTALL THE TERMINAL COVERS ENCLOSED WITH THE PRODUCT BEFORE TURNING ON THE POWER OR OPERATING THE PRODUCT AFTER INSTALLATION OR WIRING WORK. FAILURE TO INSTALL THE TERMINAL COVER COULD LEAD TO MALFUNCTIONS.

**CAUTION**

- Tighten the terminal screws within the specified torque range. A loose terminal screw could lead to short-circuiting or malfunctioning. If the terminal screw is too tight, short-circuiting or malfunctioning could occur due to screw damage.
- Make sure that foreign matter, such as cutting chips or wire scraps, do not enter the robot controller.
- The communication cables connected to the CC-Link compatible module must be placed in a conduit or fixed with a clamp. If the cable is not placed in a conduit or fixed with a clamp, the module or cable could be damaged by the cable shifting, movement or unintentional pulling leading to malfunctioning caused by an improper cable connection.
- Do not disconnect the communication cable connected to the CC-Link compatible module by pulling on the cable section. Loosen the screws on the connector, and then disconnect the cable. Pulling on the cable fixed with screws could lead to module or cable damage, or malfunctioning caused by an improper cable connection.

[Precautions for starting and maintenance]**WARNING**

- DO NOT TOUCH THE TERMINALS WHILE THE POWER IS ON. FAILURE TO OBSERVE THIS COULD LEAD TO MALFUNCTIONING.
- ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE CLEANING OR TIGHTENING THE TERMINAL SCREWS. FAILURE TO SHUT OFF ALL PHASES COULD LEAD TO ELECTRIC SHOCKS, PRODUCT DAMAGE OR MALFUNCTIONING. A LOOSE SCREW COULD LEAD TO DROPPING, SHORT-CIRCUITING OR MALFUNCTIONING. IF THE SCREW IS TOO TIGHT, SHORT-CIRCUITING OR MALFUNCTIONING COULD OCCUR DUE TO SCREW DAMAGE.
- NEVER DISASSEMBLE OR MODIFY ANY OF THE ROBOT CONTROLLER MODULES. FAILURE TO OBSERVE THIS COULD LEAD TO TROUBLE, MALFUNCTIONING, INJURIES OR FIRES.
- ALWAYS SHUT OFF ALL PHASES OF THE POWER SUPPLY EXTERNALLY BEFORE INSTALLING OR REMOVING THE CC-LINK COMPATIBLE MODULE. FAILURE TO SHUT OFF ALL PHASES COULD LEAD TO ROBOT CONTROLLER TROUBLE OR MALFUNCTIONING.
- WHEN USING THE ROBOT CONTROLLER WITH THE CC-LINK COMPATIBLE MODULE MOUNTED, ALWAYS MOUNT THE ENCLOSED FERRITE CORE FOR NOISE MEASURES ON THE POWER CABLE AS CLOSE TO THE ROBOT CONTROLLER AS POSSIBLE. FAILURE TO MOUNT THIS FERRITE CORE COULD LEAD TO MALFUNCTIONING CAUSED BY NOISE.

**CAUTION**

If the master station PLC and robot controller are simultaneously turned on, the CC-Link system may not operate correctly. Always first turn on the master PLC before turning on the robot controller.

[Precautions for disposal]**CAUTION**

Dispose of this product as industrial waste.

This manual does not guarantee the implementation of industrial rights or other rights, and does not authorize the implementation rights. YAMAHA shall not be held liable for any problems regarding industrial rights that occur through the use of the contents given in this manual.

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Warranty

For information on the warranty period and terms, please contact our distributor where you purchased the product.

■ **This warranty does not cover any failure caused by:**

1. Installation, wiring, connection to other control devices, operating methods, inspection or maintenance that does not comply with industry standards or instructions specified in the YAMAHA manual;
2. Usage that exceeded the specifications or standard performance shown in the YAMAHA manual;
3. Product usage other than intended by YAMAHA;
4. Storage, operating conditions and utilities that are outside the range specified in the manual;
5. Damage due to improper shipping or shipping methods;
6. Accident or collision damage;
7. Installation of other than genuine YAMAHA parts and/or accessories;
8. Modification to original parts or modifications not conforming to standard specifications designated by YAMAHA, including customizing performed by YAMAHA in compliance with distributor or customer requests;
9. Pollution, salt damage, condensation;
10. Fires or natural disasters such as earthquakes, tsunamis, lightning strikes, wind and flood damage, etc;
11. Breakdown due to causes other than the above that are not the fault or responsibility of YAMAHA;

■ **The following cases are not covered under the warranty:**

1. Products whose serial number or production date (month & year) cannot be verified.
2. Changes in software or internal data such as programs or points that were created or changed by the customer.
3. Products whose trouble cannot be reproduced or identified by YAMAHA.
4. Products utilized, for example, in radiological equipment, biological test equipment applications or for other purposes whose warranty repairs are judged as hazardous by YAMAHA.

THE WARRANTY STATED HEREIN PROVIDED BY YAMAHA ONLY COVERS DEFECTS IN PRODUCTS AND PARTS SOLD BY YAMAHA TO DISTRIBUTORS UNDER THIS AGREEMENT. ANY AND ALL OTHER WARRANTIES OR LIABILITIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXPRESSLY DISCLAIMED BY YAMAHA. MOREOVER, YAMAHA SHALL NOT BE HELD RESPONSIBLE FOR CONSEQUENT OR INDIRECT DAMAGES IN ANY MANNER RELATING TO THE PRODUCT.

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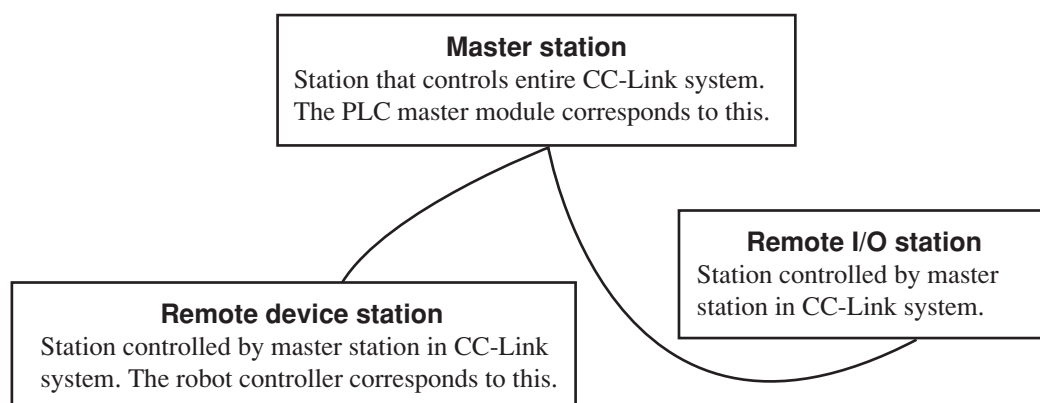
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1. Features

CC-Link is the abbreviation of Control & Communication Link. The CC-Link system connects the robot controller and dispersed input/output modules with dedicated cables, and controls these modules from the master station PLC. The CC-Link system allows wiring to be reduced.



CC-Link is a registered trademark of CC-Link partner association.
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NOTE

The dedicated input of STD.DIO connector provided on the RCX240 controllers will be disabled except for an interlock signal (DI 11). When the Board condition (external 24V monitor control) of system parameters is set invalid, the interlock signal (DI 11) will also be disabled. On the RCX22x, the dedicated input of STD.DIO connector will be disabled, but the interlock signal (DI 11) in SAFETY connector enabled.

[Wiring saving]

One dedicated cable (4-wire) is used to connect the robot controller and PLC. This allows the entire system wiring to be reduced.

[Emulated serialization on parallel DIO]

By making the robot controller's internal settings without using a robot program, the various I/O devices, such as the sensors and relays mounted on the robot controller's parallel I/O can be controlled from the PLC as if they were CC-Link system I/O devices.

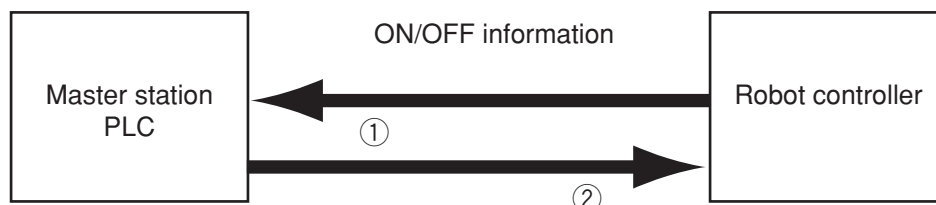


CAUTION

An emergency stop terminal for hardwire is provided in SAFETY connector on the robot controller. In the case of the RCX240, when the CC-Link system is used while STD. DIO is not used (external DC 24V power supply is not used), the Board condition (external 24V monitor control) of system parameters must be set invalid. If it is left valid, the STD. DIO interlock signal is enabled causing an error in the robot operation commands.

2. Mechanism

The mechanism of communication is explained in this section to provide an understanding of how the robot controller and PLC operate via the CC-Link system.



- ① The robot controller's ON/OFF information is sent to the master station PLC via the network (CC-Link system cable).
- ② The master station PLC's ON/OFF information is sent to the robot controller via the network (CC-Link system cable).

- * **The robot controller monitors the ON/OFF information at a 10ms cycle.**
- * **The ON/OFF information consists of 16 points each of dedicated I/O points, 96 points each of general-purpose I/O points as bit information, and two words each of dedicated I/O words, 14 words each of general-purpose I/O words as word information.**

If the following is executed with the robot program in the robot controller, the bit information will be sent to the master station PLC via the CC-Link system by ①.

SO (20) = 1

Conversely, if the following is executed with the robot program, the bit information received from the master station PLC via the CC-Link system will be monitored by ②, and will wait for the ON information.

WAIT SI (20) = 1

If the following is executed with the robot program in the robot controller, the word information will be sent to the master station PLC via the CC-Link system by ①.

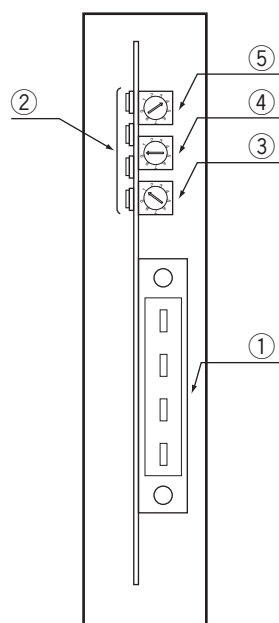
SOW (2) = 256

Conversely, if the following is executed with the robot program, the word information received from the master station PLC via the CC-Link system will be substituted in integer variable A% by ②.

A% = SIW (3)

3. Names of each part on the CC-Link compatible module

The part names of the CC-Link compatible module installed in the robot controller are described in this section. The CC-Link compatible module is installed into an optional slot in the robot controller.



Front of the unit

① **CC-Link system cable terminals**

These terminals are used to connect the CC-Link system cable. Each of the four terminals has a meaning, so do not make miswiring. These terminals are "DA", "DB", "DG" and "SLD" from the top.

② **Transmission monitor LED**

The status in the CC-Link system is indicated with ON, OFF and flickering status of four LEDs. These terminals are "RUN", "ERRL", "SD" and "RD" from the top.

③ **Station No. setting switch (LSB: 1st digit)**

This is the rotary switch for setting the robot controller station No. in the CC-Link system. The 1st digit of the station No. is set with this switch.

④ **Station No. setting switch (MSB: 2nd digit)**

This is the rotary switch for setting the robot controller station No. in the CC-Link system. The 2nd digit of the station No. is set with this switch.

⑤ **Communication speed switch (BPS)**

This is the rotary switch for setting the CC-Link system's communication speed.

4. Assignment of CC-Link compatible I/O

The I/O expressions used in the robot controller's program language and the I/O expressions for the remote device stations differ. The correspondence is shown below.

Output from robot controller			Input to robot controller		
Program language		Remote device station	Program language		Remote device station
	SOW(0) ^{*3}	RWr0		SIW(0) ^{*3}	RWw0
	SOW(1) ^{*3}	RWr1		SIW(1) ^{*3}	RWw1
SOD(2)	SOW(2)	RWr2	SID(2)	SIW(2)	RWw2
	SOW(3)	RWr3		SIW(3)	RWw3
SOD(4)	SOW(4)	RWr4	SID(4)	SIW(4)	RWw4
	SOW(5)	RWr5		SIW(5)	RWw5
SOD(6)	SOW(6)	RWr6	SID(6)	SIW(6)	RWw6
	SOW(7)	RWr7		SIW(7)	RWw7
SOD(8)	SOW(8)	RWr8	SID(8)	SIW(8)	RWw8
	SOW(9)	RWr9		SIW(9)	RWw9
SOD(10)	SOW(10)	RWrA	SID(10)	SIW(10)	RWwA
	SOW(11)	RWrB		SIW(11)	RWwB
SOD(12)	SOW(12)	RWrC	SID(12)	SIW(12)	RWwC
	SOW(13)	RWrD		SIW(13)	RWwD
SOD(14)	SOW(14)	RWrE	SID(14)	SIW(14)	RWwE
	SOW(15)	RWrF		SIW(15)	RWwF
SO0(7~0) ^{*1}		RXn7~RXn0	SI0(7~0) ^{*1}		RYn7~RYn0
SO1(7~0) ^{*1}		RXnF~RXn8	SI1(7~0) ^{*1}		RYnF~RYn8
SO2(7~0)		RX(n+1)7~RX(n+1)0	SI2(7~0)		RY(n+1)7~RY(n+1)0
SO3(7~0)		RX(n+1)F~RX(n+1)8	SI3(7~0)		RY(n+1)F~RY(n+1)8
SO4(7~0)		RX(n+2)7~RX(n+2)0	SI4(7~0)		RY(n+2)7~RY(n+2)0
SO5(7~0)		RX(n+2)F~RX(n+2)8	SI5(7~0)		RY(n+2)F~RY(n+2)8
SO6(7~0)		RX(n+3)7~RX(n+3)0	SI6(7~0)		RY(n+3)7~RY(n+3)0
SO7(7~0)		RX(n+3)F~RX(n+3)8	SI7(7~0)		RY(n+3)F~RY(n+3)8
SO10(7~0)		RX(n+4)7~RX(n+4)0	SI10(7~0)		RY(n+4)7~RY(n+4)0
SO11(7~0)		RX(n+4)F~RX(n+4)8	SI11(7~0)		RY(n+4)F~RY(n+4)8
SO12(7~0)		RX(n+5)7~RX(n+5)0	SI12(7~0)		RY(n+5)7~RY(n+5)0
SO13(7~0)		RX(n+5)F~RX(n+5)8	SI13(7~0)		RY(n+5)F~RY(n+5)8
SO14(7~0)		RX(n+6)7~RX(n+6)0	SI14(7~0)		RY(n+6)7~RY(n+6)0
SO15(7~0)		RX(n+6)F~RX(n+6)8	SI15(7~0)		RY(n+6)F~RY(n+6)8
-----		RX(n+7)F~RX(n+7)0 ^{*2}	-----		RY(n+7)F~RY(n+7)0 ^{*2}

n: Address assigned to master module with station No. setting
n = (station No. - 1) × 2

Caution)

*1: Has a meaning in the robot controller's internal process as a dedicated input/output. This cannot be used as a general-purpose input/output in the robot program.

*2: This area is reserved for the CC-Link system.

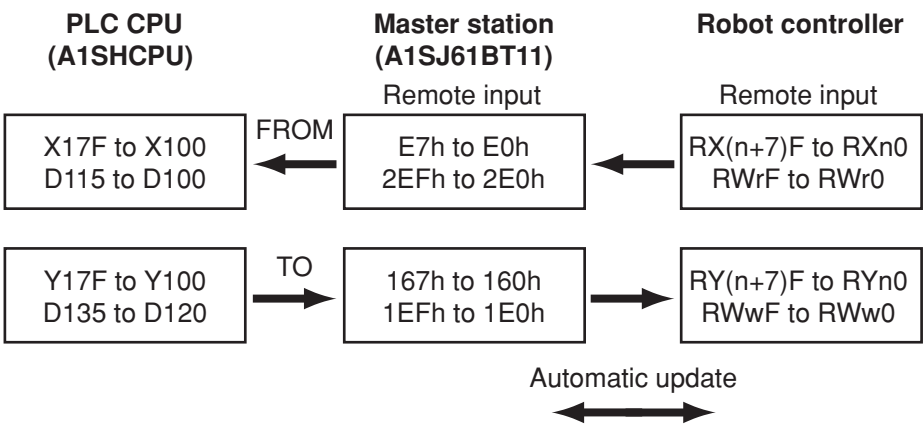
*3: Has a meaning in the robot controller's internal process as a dedicated command region. This cannot be used as a general-purpose input/output in the robot program.



NOTE

- SIW(n) and SOW(n) are handled as numerical data of word with no sign. SID(n) and SOD(n) are handled as numerical data of double words with a sign.
- The dedicated input of STD.DIO connector provided on the RCX240 controllers will be disabled except for an interlock signal (DI 11). When the Board condition (external 24V monitor control) of system parameters is set invalid, the interlock signal (DI 11) will also be disabled. On the RCX22x, the dedicated input of STD.DIO connector will be disabled, but the interlock signal (DI 11) in SAFETY connector enabled.

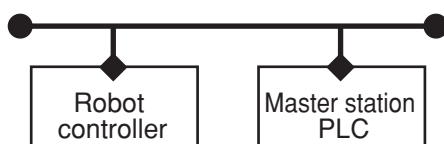
An example of the flow of the I/O information in the robot controller (remote device station) is shown below. The buffer memory in the master station used to store the I/O information differs according to the PLC type and station No, etc. Refer to the PLC manual for details.



5. Shift of CC-Link system connection status and robot controller status

Always start the CC-Link system specification robot controller in the servo OFF state after the power is turned ON.

① Normal state of CC-Link system connection when robot controller power is turned ON

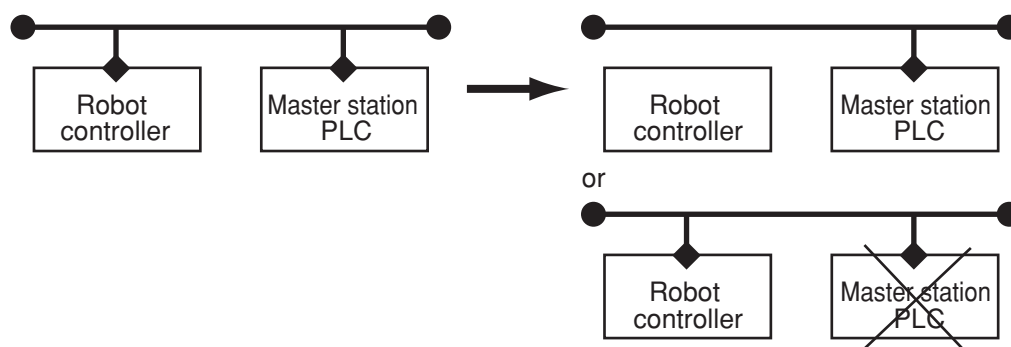


- Emergency stop/interlock signals in CC-Link system are valid.
- When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid. (RCX240)
- Interlock signal in SAFETY connector is valid. (RCX22x)
- When the Board condition (external 24V monitor control) of system parameters is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX240)
- When SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX22x)

* The signals in the CC-Link system are sent and received.

* Always initialize with the master station PLC when connecting to the CC-Link system.

② Shift from CC-Link system normal connection state to CC-Link system erroneous connection state

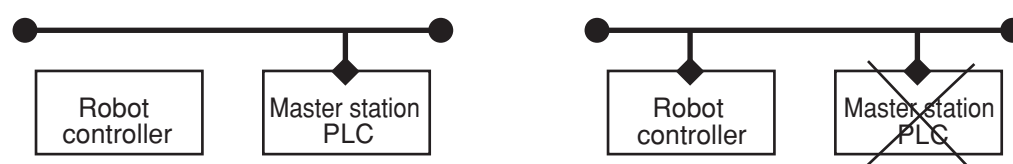


- Emergency stop input turns off with SI (00) in the robot controller.
- Service mode input turns off with SI (02) in the robot controller.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid. (RCX240)

- Interlock signal in SAFETY connector is valid. (RCX22x)
- When the Board condition (external 24V monitor control) of system parameters is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX240)
- When SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX22x)
- * The signals in the CC-Link system are not sent or received.
- * The "CC-Link Communication Error" is added to the error history in the robot controller.
- * If the connection to the CC-Link system shifts from the normal state to the erroneous state, the CC-Link system connection must be returned to the normal state.
- * The CC-Link system will return when the CC-Link system connection is recovered to the normal state.

③ CC-Link system erroneous connection state due to following factors when robot controller power is turned ON

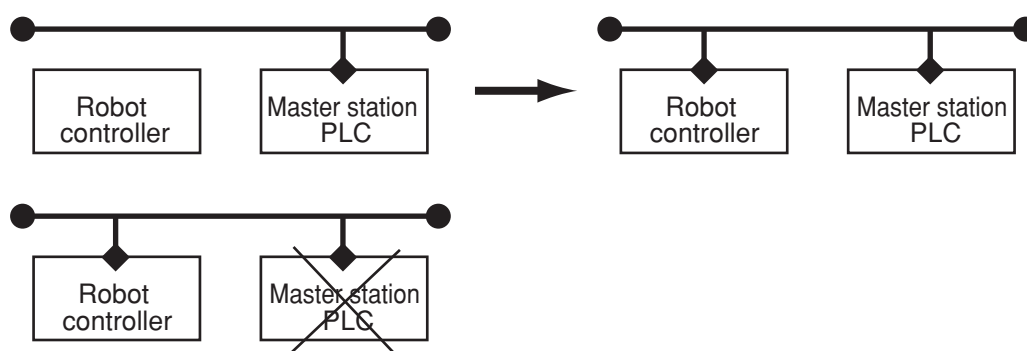
- Connection to CC-Link system not possible
- Error in master station PLC



- Emergency stop/interlock signals in CC-Link system are invalid.
- When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid. (RCX240)
- Interlock signal in SAFETY connector is valid. (RCX22x)
- When the Board condition (external 24V monitor control) of system parameters is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX240)
- When SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX22x)
- * The signals on the CC-Link system cannot be exchanged.
- * As opposed to the state given in ②, in this state, the emergency stop state by SI (00) is not attained in the controller, so the robot can be operated from the programming box. (The robot controller can be started independently when setting up the system, etc.)

- * Service mode input signal cannot be invalidated with SI (02) when SAFE mode is enabled, so change the service mode parameter setting in SYSTEM > PARAM mode. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.
- * When the connection to the CC-Link system is correctly recovered, the system will automatically return to the CC-Link system.
- * The "CC-Link Communication Error" has been added to the error history in the robot controller.
(A standby state for up to 2.5 seconds will occur to check the communication.)

④ **Transmission from CC-Link system erroneous connection state to CC-Link correct connection state when robot controller power is turned ON**



- CC-Link system emergency stop/interlock signals change to valid state.
 - Emergency stop terminal in SAFETY connector is valid.
 - Interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid. (RCX240)
 - Interlock signal in SAFETY connector is valid. (RCX22x)
 - When the Board condition (external 24V monitor control) of system parameters is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX240)
 - When SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector. (RCX22x)
- * The signals in the CC-Link system can be sent and received.
 - * When the connection to the CC-Link system shifts to the normal state, the initialization process must be carried out with the master station PLC when connecting to the CC-Link system.
 - * When service mode parameter setting in SYSTEM > PARAM mode has been changed while SAFE mode is enabled, make the service mode parameter setting again. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.
 - * The CC-Link system will return when the CC-Link system connection is recovered to the normal state.

Contents

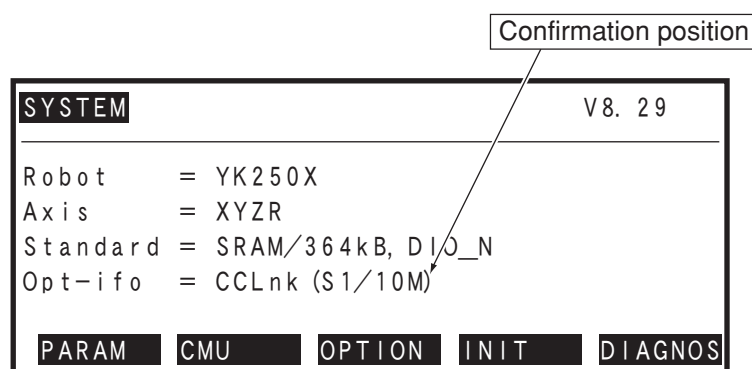
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1. Confirming the CC-Link compatible module settings

When using the CC-Link system specification robot controller, the CC-Link compatible module's MAC ID and communication speed setting can be confirmed from a programming box (RPB for RCX22x and RCX240 or MPB for RCX14x; hereafter called "MPB/RPB").

- **When connecting CC-Link compatible module to existing robot controller**
→ Follow the procedures given in section 2., and change the settings for the CC-Link system specifications.
- **For CC-Link system specification robot controller**
(When robot controller is purchased with CC-Link compatible module mounted)
→ Follow the procedures given in section 3., and set the station No. and communication speed.



[Operation]

1. Press the **MODE** key on the MPB/RPB.
2. Press the **F 4** (SYSTEM) key on the MPB/RPB.
3. The display above will appear. The station No. and communication speed set for the CC-Link system will appear in the parentheses following "CCLnk" on the screen. The meaning of the above example is shown below.

S1 : Station No. 1

(Setting range: 1 to 61)

* Four stations are occupied. Thus, this means that (station No. +3) is occupied.

10M : 10Mbps

(Setting communication speed [unit: bps]: 156K, 625K, 2.5M, 5M, 10M)

* The communication speed must match the master station setting.



CAUTION

If the robot controller is not connected to the CC-Link system or if there is an error in the CC-Link system, the error "CC-Link Communication Error" will appear on the MPB/RPB when the robot controller power is turned ON. The above settings can be confirmed even in this state.

2. Setting to the CC-Link system specification controller

When connecting the CC-Link compatible module to an existing robot controller, the CC-Link compatible module must be installed in the robot controller. Check the CC-Link system specifications with the procedure given in section 1.

2.1 Saving the robot controller data

Before installing the CC-Link compatible module into the robot controller, be sure to save the data stored in the robot controller into an external memory by using VIP software, etc.

2.2 Installing the CC-Link compatible module

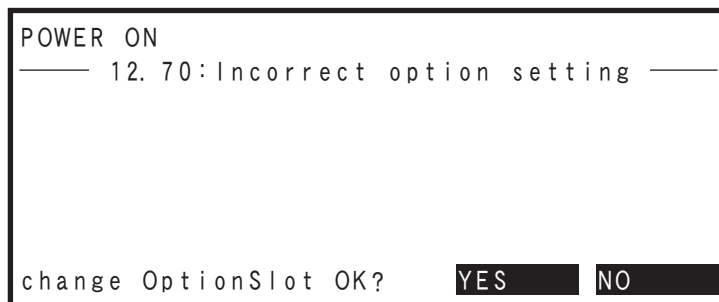
Install the CC-Link compatible module into the robot controller. Also set the station No. and communication baud rate for the CC-Link compatible module with the procedures given in "3. Setting the CC-Link compatible module" in chapter 2.

2.3 Response when starting the robot controller

The robot controller will always start up with an "option board setting error" after the CC-Link compatible module has been installed. **Make the following settings as explained below.**

[Procedure]

1. Make connections to all input connectors on the front panel of the robot controller.
2. The following type of question will appear on the MPB/RPB screen, so answer as "YES".



3. If the controller does not operate properly because of a memory error, etc., load the data saved in step 2.1 into the controller. Refer to the controller user's manual for details on loading the data. If the robot controller is not correctly connected with the CC-Link system, the message "CC-Link Communication Error" will appear on the MPB/RPB.



NOTE

For instructions on how to load data using the support software VIP, refer to the VIP user's manual.

3. Setting the CC-Link compatible module

To connect the CC-Link system specification controller to the CC-Link system, the station No. and communication speed must be set with the rotary switch on the CC-Link compatible module. Confirm the current station No. and communication speed with the procedures given in section 1.

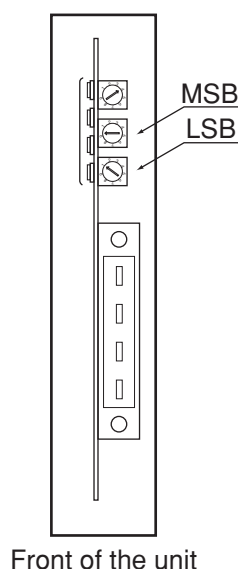
3.1 Setting the station No.

Using the rotary switches MSB and LSB in front of the CC-Link compatible module, set the station No. of the robot controller in the CC-Link system.



NOTE

Up to 64 stations can be set in the CC-Link system, but the CC-Link system itself occupies 4 stations (specified No. +3), so set the station No. between 1 and 61.



Front of the unit



WARNING

WHEN SETTING THE STATION NO., COMPLETELY SHUT OFF THE POWER SUPPLIED TO THE ROBOT CONTROLLER.

[Procedures]

1. Check the station No. of the robot controller in the CC-Link system.
The station No. must be set between 1 and 61.
2. Using a flat-blade precision screwdriver, set the 10th digit on rotary switch MSB.
3. In the same manner, set the 1st digit on rotary switch LSB.



CAUTION

- Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.
- Do not apply impact on the CC-Link compatible module.
- Do not place water or conductive matters, etc., which could cause damage near the CC-Link compatible module.
- Accurately set the station No.
- When setting the BPS, make sure not to set the rotary switches MSB and LSB by mistake.

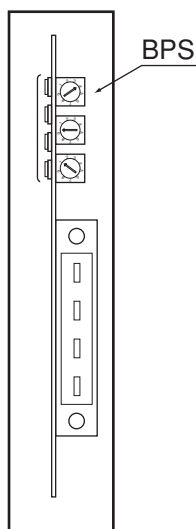
3.2 Setting the communication speed

Using the rotary switch BPS in front of the CC-Link compatible module, set the communication speed for the robot controller in the CC-Link system.



NOTE

The communication speed must match the CC-Link system's master station setting.



Front of the unit

**WARNING**

WHEN SETTING THE STATION NO., COMPLETELY SHUT OFF THE POWER SUPPLIED TO THE ROBOT CONTROLLER.

[Procedures]

1. Confirm the communication speed for the robot controller in the CC-Link system. The communication speed must be set between 156K and 10Mbps. The correspondence of the communication speed and switch is shown below.

Switch No.	0	1	2	3	4	Other than left setting
Communication speed [bps]	156K	625K	2.5M	5M	10M	Error

2. Using a flat-blade precision screwdriver, set the switch No. corresponding to the communication speed with rotary switch BPS.

**CAUTION**

- Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.
- Do not apply impact on the CC-Link compatible module.
- Do not place water or conductive matters, etc., which could cause damage near the CC-Link compatible module.
- Accurately set the communication speed.
- When setting the MSB and LSB, make sure not to set the rotary switch BPS by mistake.

4. Noise measures

Two ferrite cores must be mounted on the input power cable when connecting to the CC-Link system.

4.1 Mounting the ferrite core

Mount two ferrite cores onto the input power cable connected to the input power connector on the front panel of the robot controller.

**WARNING**

COMPLETELY SHUT OFF THE POWER SUPPLY TO THE INPUT POWER CABLE BEFORE STARTING THIS WORK.

[Procedures]

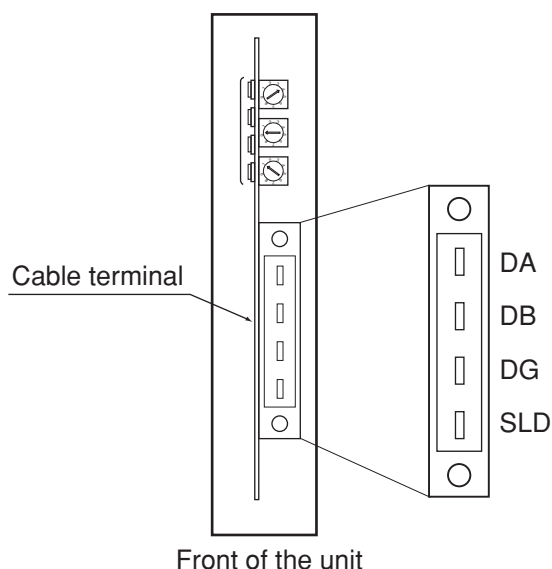
1. Mount the two ferrite cores (supplied) onto the input power cable. The ferrite core should be placed as close to the robot controller body as possible.
2. Fix the mounted ferrite core with an Insulock tie, etc.

**CAUTION**

Securely fix the ferrite core. If the ferrite core is not mounted, trouble could occur with the CC-Link system operations.

5. Connecting to the CC-Link system

The CC-Link system cable must be connected to the CC-Link compatible module in order to connect to the CC-Link system.



WARNING

WHEN SETTING THE STATION NO., COMPLETELY SHUT OFF THE POWER SUPPLIED TO THE ROBOT CONTROLLER.

5.1 Connecting to the cable terminal to the controller

Connect the CC-Link system cable to the CC-Link system cable terminal on the CC-Link compatible module.

[Procedure]

1. Using a phillips head screwdriver, completely loosen the two screws on both sides of the CC-Link system cable terminal, and remove the terminal block section from the CC-Link compatible module.



CAUTION

Always remove the terminal block section when installing the CC-Link system cable.

2. Using a phillips head screwdriver, securely fix the CC-Link system cable to the terminal block removed in step 1. The name of each terminal on the cable terminal block is shown above.
 - * When connecting a terminator, connect it across DA-DB.
 - * A slit to prevent incorrect inverted insertion is provided on the cable terminal block.

**CAUTION**

- Securely fix the CC-Link system cable.
- Carefully carry out the work to avoid applying excessive force on the CC-Link cable.
- Treat each end of the CC-Link system cable wire with a round terminal or Y terminal so that it will not dislocate.
- Carefully carry out the work so that the CC-Link system cable is not incorrectly wired.

3. Connect the cable terminal, into which the CC-Link system cable has been installed, to the CC-Link compatible module terminal block section on the robot controller, and completely fix with the two screws on both sides using a Phillips head screwdriver.

**CAUTION**

Refer to the master station PLC instruction manual for details on the CC-Link system cable connection.

5.2 Testing the line from the master station PLC

The master station PLC in the CC-Link system has a function to test the line to the remote station. Using this function, confirm that the robot controller is accurately recognized as a remote station in the CC-Link system. Refer to the master station PLC instruction manual for details.

**CAUTION**

If the line test results indicate a correct connection, place the CC-Link system cable into a conduit, or fix it with a clamp.

6. Parameter setting for CC-Link serial I/O board

The following functions are enabled or disabled by setting the parameters for the CC-Link serial I/O board.

	Parameter	Meaning
1	[RCX240] Board condition [RCX22x] Serial I/O	Enables or disables the serial I/O board. When set to "VALID" the serial I/O can be used. When set to "INVALID" the serial I/O cannot be used.
2	Remote cmd / IO cmd (SI05)	Enables or disables the functions of remote commands and I/O commands using word information and bit information. When set to "VALID" the remote commands and I/O commands can be used. When set to "INVALID" the remote commands and I/O commands cannot be used. This parameter cannot be set to "VALID" simultaneously with parameter 3.
3	Output MSG to SOW(1)	Enables or disables the function to send a message number, which is displayed on the MPB/RPB, to word information SOW(1). When set to "VALID" the message number to be displayed on the MPB/RPB will be output. When set to "INVALID" the message number to be displayed on the MPB/RPB will not be output. This parameter cannot be set to "VALID" simultaneously with parameter 2.



NOTE

- When not using the serial I/O board, set the "board condition" ("serial I/O" for RCX22x) parameter to "INVALID".
- When the "board condition" ("serial I/O" for RCX22x) parameter is set to "INVALID", the dedicated input/output of STD.DIO connector becomes enabled. When the "board condition" parameter is set to "VALID", the dedicated input (except DI11 for RCX240) of STD.DIO connector becomes disabled.
- For remote commands and I/O commands, refer to the command reference manual.
- For a description of codes issued from the message output function for SOW(1), refer to "1. Error message" in chapter 9.
- When the Remote command & I/O command parameter is set to "VALID", the Output MSG to SOW(1) parameter cannot be set to "VALID".
Likewise, when the Output MSG to SOW(1) parameter is set to "VALID", the Remote command & I/O command parameter cannot be set to "VALID".

6.1 Parameter setting for CC-Link serial I/O board

[Operation]

1. Press the **F 1** (PARAM) key in "SYSTEM" mode to enter "SYSTEM>PARAM" mode.
2. Press the **F 5** (OP. BRD) key in "SYSTEM>PARAM" mode to enter the option board parameter setting mode.
The option boards installed in the controller are displayed in order on the MPB screen.

SYSTEM>PARAM>OP. BRD		V8. 18
1. DIO_N (1)	VALID	
2. ---		
3. CCLnk (S1/10M)	VALID	
4. ---		
SELECT [] [] [] [] []		

Option boards installed into the option slots are displayed on the MPB screen.

Type	Display	Meaning
Option DIO	DIO_N(n)	An option DIO board of NPN specifications is installed. The number in parentheses is an ID number.
	DIO_P(n)	An option DIO board of PNP specifications is installed. The number in parentheses is an ID number.
Serial I/O	CCLnk(n/m)	A CC-Link unit is installed. Letters in parentheses indicate a station number "n" and a communication speed "m".
	D_Net(n/m)	A DeviceNet unit is installed. Letters in parentheses indicate a MAC ID number "n" and communication speed "m".
	Profi(n/m)	A Profibus unit is installed. Letters in parentheses indicate a station address "n" and communication speed "m".
Network	E_Net	An Ethernet unit is installed.
YC-Link	YCLnk(Mn)	A YC-Link unit is installed. Letters in parentheses indicate a station number "n".

3. In "SYSTEM>PARAM>OP. BRD" mode, select the "CCLnk" with the cursor (↑/↓) keys and press the **F 1** (SELECT) key.

SYSTEM>PARAM>OP. BRD>SELECT		V8. 18
1. board condition	VALID	
2. remote cmd / IO cmd (S105)	VALID	
3. Output MSG to SOW (1)	INVALID	
EDIT JUMP [] [] [] [] []		

4. Select the parameter with the cursor (↑/↓) keys.

SYSTEM>PARAM>OP. BRD>SELECT		V8. 18
1. board condition		VALID
2. remote cmd / IO cmd (SI05)		VALID
3. Output MSG to SOW (1)		INVALID
EDIT JUMP		

5. Press the F 1 (EDIT) key.

SYSTEM>PARAM>OP. BRD>SELECT		V8. 18
1. board condition		VALID
2. remote cmd / IO cmd (SI05)		VALID
3. Output MSG to SOW (1)		INVALID
INVALID VALID		

6. Press the F 1 (INVALID) or F 2 (VALID) key.

7. Press the ESC key to quit the edit mode. To continue setting another parameter, use the cursor (↑/↓) keys to select the parameter.

MEMO

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1. State when robot controller power is turned ON

The CC-Link system specification robot controller always starts operation in servo OFF state when the power turned ON.

① When connection to CC-Link system is correctly established.

The following conditions must be satisfied to correctly connect to the CC-Link system:

- The CC-Link system cable must be physically connected
- The station No. and communication speed must be correctly set
- The master station PLC must be operating correctly

When the robot controller is correctly connected to the CC-Link system, the normal state will be indicated with the LEDs on the CC-Link compatible module.

At this time, the emergency stop signal and interlock signal in the CC-Link system will be valid, so these signals must be turned ON with the initial data process.

The emergency stop terminal in SAFETY connector is always kept valid. On the RCX22x, the interlock signal in SAFETY connector is also valid. On the RCX240, the interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid.

When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system. Service mode input signal to the RCX22x is also made valid with DI (02) in SAFETY connector. On the RCX240, service mode input signal is made valid with DI (02) in SAFETY connector unless the Board condition (external 24V monitor control) of system parameters is set invalid.

② When connection to CC-Link system is incorrectly established

The following causes can be considered a correct connection with the CC-Link system cannot be established:

- The CC-Link system cable is not physically connected
- The station No. or communication speed is set incorrectly
- The master station PLC is not operating correctly

When the robot controller is incorrectly connected to the CC-Link system, the error state will be indicated with the LEDs on the CC-Link compatible module. Note that if the master station PLC is not operating correctly, nothing will appear on the LEDs. The emergency stop signal and interlock signal in the CC-Link system are invalid in this case, so the robot controller can be operated independently. However, if the correct state has been established even once after the robot controller power was turned ON, the robot controller's emergency stop state cannot be canceled without correctly connecting to the CC-Link system.

The emergency stop terminal in SAFETY connector is always kept valid. On the RCX22x, the interlock signal in SAFETY connector is also valid. On the RCX240, the interlock signal in STD. DIO connector is valid unless the Board condition (external 24V monitor control) of system parameters is set invalid.

When SAFE mode is enabled, service mode input signal to the RCX22x is made valid with DI (02) in SAFETY connector. On the RCX240, service mode input signal is made valid with DI (02) in SAFETY connector unless the Board condition (external 24V monitor control) of system parameters is set invalid.

1. State when robot controller power is turned ON

Service mode input signal in the CC-Link system cannot be invalidated when SAFE mode is enabled, so change the service mode setting in SYSTEM > PARAM mode. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.

* **For meanings of LED display, see Chapter 4 in this manual.**

2. Initial process for connecting to CC-Link system

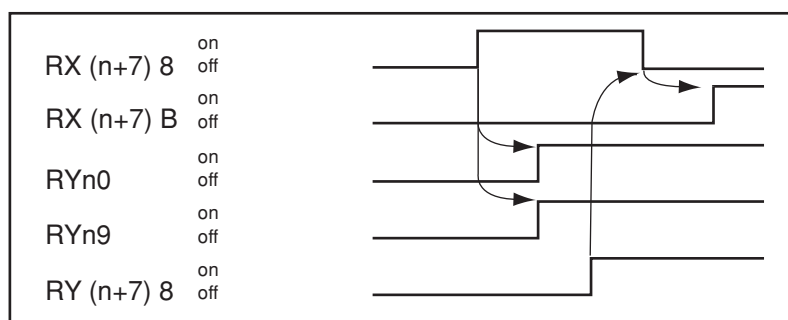
The initial data process must be carried out to correctly connect to the CC-Link system.

2.1 Initial data process

The initial data process is carried out to confirm that the robot controller is correctly connected to the CC-Link system. Prepare the process on the master station PLC side so that the following type of process is always carried out before data is exchanged.

Initial data process (master station PLC side)

- ① Confirm that RX(n+7)8 (initial data process request flag) is ON.
- ② Turn RYn0 (emergency stop input) and RYn9 (interlock input) ON.
- ③ Turn RY(n+7)8 (initial data process completion flag) ON.
- ④ Confirm that RX(n+7)8 (initial data process request flag) is OFF.
- ⑤ Confirm that RX(n+7)B (remote Ready) is ON.



The robot controller internal process will automatically start when the power is turned ON and the system is returned from an error state.



CAUTION

- RX(n+7) B (remote Ready) must always be used on the master station PLC side as the flag to indicate whether the robot controller is operating correctly.
- When starting up the system in the emergency stop state using RYn0 (emergency stop input), carry out the initial data process first, and then turn RYn0 (emergency stop input) OFF. The robot controller will start up in the servo OFF state when the power is turned ON.

3. Communication with master station PLC

The method for communicating with the master station PLC by using the robot program when the CC-Link system is correctly connected is explained in this section.

3.1 Receiving data

Data is received by reading the master station PLC output device data with the robot controller's input port. The correspondence of the master station PLC's output device numbers and robot controller's input port numbers is shown below.

Master station output device No.	Robot controller input port No.	Master station output device No.	Robot controller input port No.	
RYn7~RYn0	SI(07)~SI(00)	RWwn		SIW(0)
RYnF~RYn8	SI(17)~SI(10)	RWw(n+1)		SIW(1)
RY(n+1)7~RY(n+1)0	SI(27)~SI(20)	RWw(n+2)	SID(2)	SIW(2)
RY(n+1)F~RY(n+1)8	SI(37)~SI(30)	RWw(n+3)		SIW(3)
RY(n+2)7~RY(n+2)0	SI(47)~SI(40)	RWw(n+4)	SID(4)	SIW(4)
RY(n+2)F~RY(n+2)8	SI(57)~SI(50)	RWw(n+5)		SIW(5)
RY(n+3)7~RY(n+3)0	SI(67)~SI(60)	RWw(n+6)	SID(6)	SIW(6)
RY(n+3)F~RY(n+3)8	SI(77)~SI(70)	RWw(n+7)		SIW(7)
RY(n+4)7~RY(n+4)0	SI(107)~SI(100)	RWw(n+8)	SID(8)	SIW(8)
RY(n+4)F~RY(n+4)8	SI(117)~SI(110)	RWw(n+9)		SIW(9)
RY(n+5)7~RY(n+5)0	SI(127)~SI(120)	RWw(n+10)	SID(10)	SIW(10)
RY(n+5)F~RY(n+5)8	SI(137)~SI(130)	RWw(n+11)		SIW(11)
RY(n+6)7~RY(n+6)0	SI(147)~SI(140)	RWw(n+12)	SID(12)	SIW(12)
RY(n+6)F~RY(n+6)8	SI(157)~SI(150)	RWw(n+13)		SIW(13)
		RWw(n+14)	SID(14)	SIW(14)
		RWw(n+15)		SIW(15)

n: Address assigned to master module with station No. setting



CAUTION

SIW(0) and SIW(1) are viewed as dedicated input ports. The robot controller handles these ports as input ports of meaningful data, so do not use them as general-purpose input ports.

Set these ports to "0" in most cases.

When reading the bit information from the master station PLC's output device No. with the robot controller, write the following commands in the robot program in the same manner as the DI input port:

WAIT command

Assignment statement

Example :To wait for RY(n+1)0 to turn ON
 WAIT SI(20) = 1 *The robot program will wait for SI(20) to turn ON.

Example :To read the RY(n+1) 0 to RY(n+1)7 data in variable A
 A = SI2() *The SI2() data will be converted into a decimal and assigned to variable A.
 If SI2() is 7Fh, variable A will be 127.



NOTE

The SI statement in the robot language can be defined from SI0 () to SI27 (), but the CC-Link compatible module accepts from SI0 () to SI15 ().

When reading the word information from the master station PLC's output device No. with the robot controller, write the following command in the robot program.

Assignment statement

Example :To read the RWw (n+2) word data in variable B
 B = SIW (2) *The SIW (2) data will be assigned to variable B as a decimal. If SIW (2) is 01FFh, variable B will be 511.

Example :To read the RWw (n+2) and RWw (n+3) double word data into variable C
 C = SID (2) *The SIW (2) and SIW (3) data will be assigned to variable C as a decimal.
 If SIW (2) is 0010h and SIW (3) is 0001h, variable C will be 65552.



NOTE

Word data read out with SIW(n) is a little endian format with no sign.
 Double word data read out with SID(n) is a little endian format with a sign.

3.2 Transmitting data

Data is transmitted by writing the robot controller output port data into the master station PLC's input device. The correspondence of the master station PLC's input device numbers and robot controller's output port numbers is shown below.

Master station input device No.	Robot controller output port No.	Master station input device No.	Robot controller output port No.
RXn7~RXn0	SO(07)~SO(00)	RWrn	SOW(0)
RXnF~RXn8	SO(17)~SO(10)	RWr(n+1)	SOW(1)
RX(n+1)7~RX(n+1)0	SO(27)~SO(20)	RWr(n+2)	SOD(2) SOW(2)
RX(n+1)F~RX(n+1)8	SO(37)~SO(30)	RWr(n+3)	SOW(3)
RX(n+2)7~RX(n+2)0	SO(47)~SO(40)	RWr(n+4)	SOD(4) SOW(4)
RX(n+2)F~RX(n+2)8	SO(57)~SO(50)	RWr(n+5)	SOW(5)
RX(n+3)7~RX(n+3)0	SO(67)~SO(60)	RWr(n+6)	SOD(6) SOW(6)
RX(n+3)F~RX(n+3)8	SO(77)~SO(70)	RWr(n+7)	SOW(7)
RX(n+4)7~RX(n+4)0	SO(107)~SO(100)	RWr(n+8)	SOD(8) SOW(8)
RX(n+4)F~RX(n+4)8	SO(117)~SO(110)	RWr(n+9)	SOW(9)
RX(n+5)7~RX(n+5)0	SO(127)~SO(120)	RWr(n+10)	SOD(10) SOW(10)
RX(n+5)F~RX(n+5)8	SO(137)~SO(130)	RWr(n+11)	SOW(11)
RX(n+6)7~RX(n+6)0	SO(147)~SO(140)	RWr(n+12)	SOD(12) SOW(12)
RX(n+6)F~RX(n+6)8	SO(157)~SO(150)	RWr(n+13)	SOW(13)
		RWr(n+14)	SOD(14) SOW(14)
		RWr(n+15)	SOW(15)

n: Address assigned to master module with station No. setting



CAUTION

SIW(0) and SIW(1) are viewed as dedicated input ports.

To write the robot controller's bit information into the master station PLC's input device No., write the following commands in the robot program in the same manner as the DO output port:

SET/RESET command
Assignment statement
OUT command

Example : To turn RX(n+1)0 ON
SET SO(20) or SO(20) =1 *SO(20) will turn ON.

Example : To write variable A data into RX(n+1)0 to RX(n+1)7
SO2() = A *The variable A data will be converted into a binary and assigned to SO2().
If variable A is 127, 7Fh will be set in SO2().



NOTE

The SO statement in the robot language can be defined from SO2 () to SO27 (), but the CC-Link compatible module accepts from SO2 () to SO15 ().

When writing the robot controller's word information into the master station PLC's input device No., write the following command in the robot program.

Assignment statement

Example : To write 512 into RWr (n+2) as word data

SOW (2) = 512..... *512 is assigned to SOW (2), and SOW (2) becomes 0200h.

Example : To write 69905 as the double word data for RWr (n+2) and RWr (n+3)

SOD (2) = 69905..... *69905 is assigned to SOD (2), SOW (2) becomes 1111h and SOW (3) becomes 0001h.



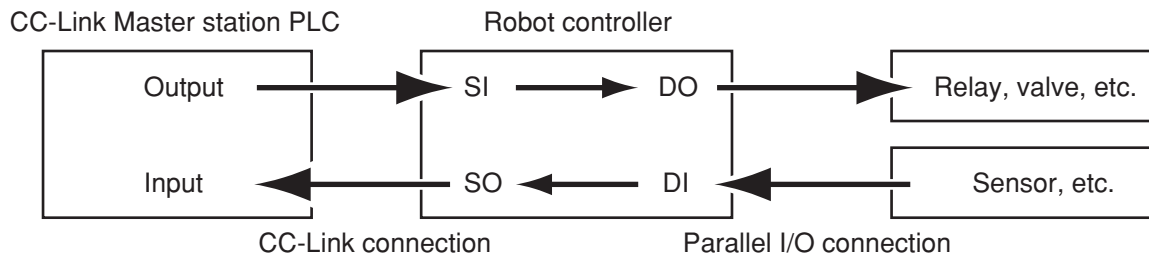
NOTE

Word data written with SOW(n) is a little endian format with no sign.

Double word data written with SOD(n) is a little endian format with a sign.

4. Direct connection by emulated serialization on parallel DIO

The robot controller's parallel input data can be transferred to the serial output data regardless of the robot program. Likewise, the robot controller's serial input data can be transferred to the parallel output data. By using this function, a sensor or relay connected to the parallel I/O of the robot controller can be used like a device connected to the CC-Link master module.



NOTE

When the directly connected and set output port is used with the program, the bit information may not become the intended value. Do not use the directly connected and set output port with the program.

4.1 Emulated serialization setting on parallel DIO

The relation of the parallel port and serial port that can be connected is shown below.

Input device such as sensor		Output device such as valve	
DI port → SO port		DO port ← SI port	
DI2()	SO2()	DO2()	SI2()
DI3()	SO3()	DO3()	SI3()
DI4()	SO4()	DO4()	SI4()
DI5()	SO5()	DO5()	SI5()

[Operation]

1. Press the **F 3** (SIO) key in "SYSTEM > OPTION" mode.

SYSTEM>OPTION>SIO		V8. 01
1. Direct SI2 0 → DO2 0		NO
2. Direct SI3 0 → DO3 0		NO
3. Direct SI4 0 → DO4 0		NO
4. Direct SI5 0 → DO5 0		NO
5. Direct SO2 0 ← DI2 0		NO
EDIT	JUMP	

Valid keys and submenu functions in this mode are as follows.

Valid keys	Menu	Function
Cursor (↑/↓) keys		Selects SIO parameters.
F1	EDIT	Sets SIO parameters.
F2	JUMP	Jumps to specified SIO parameter.



NOTE

When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

1. Direct connection from SI n () to DO n ()

Serial port input can be directly connected to parallel port output. The relation of the parallel port and serial port that can be connected is as follows.

Output device such as valve	
DO port ← SI port	
DO2()	SI2()
DO3()	SI3()
DO4()	SI4()
DO5()	SI5()



NOTE

When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

[Operation]

1. Select an SI port (from items 1 to 4) in the "SYSTEM > OPTION > SIO" mode.
2. Press the **F 1** (EDIT) key.

SYSTEM>OPTION>SIO		V8. 01
1. Direct SI2 0 -> DO2 0		NO
2. Direct SI3 0 -> DO3 0		NO
3. Direct SI4 0 -> DO4 0		NO
4. Direct SI5 0 -> DO5 0		NO
5. Direct S02 0 <- DI2 0		NO
SET	NO	

3. Press the **F 1** (SET) key to enable the connection or the **F 2** (NO) key to cancel the setting.
4. Press the **ESC** key to quit setting or select another SI port with the cursor keys to continue setting.

2. Direct connection from DI n () to SO n ()

Parallel port input can be directly connected to serial port output. The relation of the parallel port and serial port that can be connected is as follows.

Input device such as sensor	
DI port →SO port	
DI2()	SO2()
DI3()	SO3()
DI4()	SO4()
DI5()	SO5()



NOTE

When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

[Operation]

1. Select a DI port (from items 5 to 8) in the "SYSTEM > OPTION > SIO" mode.
2. Press the **F1** (EDIT) key.

SYSTEM>OPTION>SIO		V8. 01
4. Direct S15 0	→ DO5 0	NO
5. Direct S15 0	← DI2 0	NO
6. Direct S03 0	← DI3 0	NO
7. Direct S04 0	← DI4 0	NO
8. Direct S05 0	← DI5 0	NO
SET	NO	

3. Press the **F1** (SET) key to enable the connection or the **F2** (NO) key to cancel the setting.
4. Press the **ESC** key to quit setting or select another DI port with the cursor keys to continue setting.

5. Referring to communication data

The ON/OFF information exchanged with the master station PLC can be referred to using the programming box (RPB for RCX22x and RCX240 or MPB for RCX14x; hereafter called "MPB/RPB"). Note that the MPB/RPB display update interval is longer than the CC-Link data update interval, so if the ON/OFF interval is short, accurate information may not be displayed.

5.1 Referring to the data from the programming box

The data exchanged with the master station PLC can be referred to with the MPB/RPB. The reference unit is the robot controller input/output port No.

SYSTEM		V8. 01
SI monitor		
SI 0 0 = &B00000111	SI 4 0 = &B11000000	
SI 1 0 = &B00001111	SI 5 0 = &B00101000	
SI 2 0 = &B00010001	SI 6 0 = &B00000111	
SI 3 0 = &B00000100	SI 7 0 = &B00000000	
PARAM	CMU	OPTION INIT DIAGNOS

* &Bxxxxxxx corresponds to the 0th bit to 7th bit from right to left.

SYSTEM		V8. 01
SIW monitor		
SIW (0) = &H0132	SIW (4) = &H0000	
SIW (1) = &H0001	SIW (5) = &H0000	
SIW (2) = &H8000	SIW (6) = &HFFFF	
SIW (3) = &H0000	SIW (7) = &H0000	
PARAM	CMU	OPTION INIT DIAGNOS

* &Hxxxx expresses a hexadecimal.

[Operation]

1. Press the **DISPLAY** key on the MPB/RPB. A screen like that shown below will appear.

SYSTEM		V8. 01
DI monitor		
DI 0 0 = &B00000111	DI 4 0 = &B11000000	
DI 1 0 = &B00001111	DI 5 0 = &B00101000	
DI 2 0 = &B00010001	DI 6 0 = &B00000111	
DI 3 0 = &B00000100	DI 7 0 = &B00000000	
PARAM	CMU	OPTION INIT DIAGNOS

2. Press the **DISPLAY** key on the MPB/RPB several times to check the status of SI input ports 0 to 7.

3. Press the **DISPLAY** key on the MPB/RPB once more to check the status of SI input ports 10 to 15.
4. Press the **DISPLAY** key on the MPB/RPB twice more to check the status of SO input ports 0 to 7.
5. Press the **DISPLAY** key on the MPB/RPB once more to check the status of SO input ports 10 to 15.
6. Press the **DISPLAY** key on the MPB/RPB twice more to check the status of SIW input ports 0 to 7.
7. Press the **DISPLAY** key on the MPB/RPB once more to check the status of SIW input ports 8 to 15.
8. Press the **DISPLAY** key on the MPB/RPB once more to check the status of SOW output ports 0 to 7.
9. Press the **DISPLAY** key on the MPB/RPB once more to check the status of SOW output ports 8 to 15.
10. To stop checking the input/output ports, press the **ESC** key.

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1. Items to confirm before starting up CC-Link system

Confirm the following items before starting up the CC-Link system.

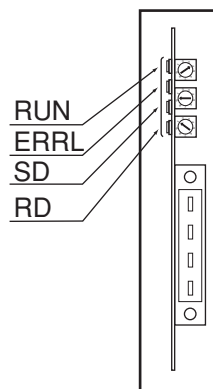
	Confirmation details	Check
1	Is the CC-Link compatible module accurately connected? (Refer to Chapter 2 section 2 or 3.)	
2	Is the robot controller set to the CC-Link system specifications? (Refer to Chapter 2 section 1.)	
3	Are the CC-Link compatible module station No. and communication speed correctly set? (Refer to Chapter 2 section 1.)	
4	Is the ferrite core connected to the power input cable to the robot controller?(Refer to Chapter 2 section 4.)	
5	Is the CC-Link system cable accurately connected to the CC-Link compatible module? (Refer to Chapter 2 section 5.)	
6	Was the line test from the master station PLC correct? (Refer to the master station PLC instruction manual.)	
7	Is the master station PLC set for the 4-station occupying remote device? (Refer to the master station PLC instruction manual.)	
8	Is the master station PLC exchanging the data for four stations? (The data for four stations must always be exchanged.)	
9	Has the initial data process been carried out between the master station and robot controller? (Refer the initialization process in Chapter 3 section 2.)	
10	Is the master station PLC judging that the robot controller is correctly functioning using RX(n+7)8 (remote Ready)? (Refer the samples in Chapter 5 section 4.)	



NOTE

The dedicated input of STD.DIO connector provided on the RCX240 controllers will be disabled except for an interlock signal (DI 11). When the Board condition (external 24V monitor control) of system parameters is set invalid, the interlock signal (DI 11) will also be disabled. On the RCX22x, the dedicated input of STD. DIO connector will be disabled, but the interlock signal (DI 11) in SAFETY connector enabled.

2. Meanings of LEDs on CC-Link compatible module



Front of the unit

The LEDs on the CC-Link compatible module express the following statuses. Use these for confirmation when an error occurs.

○ : ON ● : OFF

◎ : Blinking (This might seem to be lit depending on the ambient environment.)

RUN	ERRL	SD	RD	Meaning
○	◎	◎	○	Normal communication is taking place, but the CRC error occurs sometimes because of noise.
○	◎ (0.4s)	◎	○	The settings have varied from the baud rate and station No. setting made when connected to the CC-Link system.
○	◎	●	○	A CRC error occurred in the received data, and a response cannot be made.
○	●	◎	○	Normal communication * Normal communication is established even if data initialization is not complete. (See CAUTION below.)
●	●	●	○	There is no data addressed to the local station.
●	○	●	○	Specified station No. is not within the setting range.
●	○	●	●	Specified communication speed is not within the setting range.
●	◎	◎	○	Polling response is being carried out, but a CRC error occurred in the refresh reception.
●	◎	●	○	A CRC error occurred in the data addressed to the local station.
●	●	◎	○	There is a problem with the master station (Example) 1. CC-Link communication is not controlled by the master station. 2. The local station (RCX controller) is not set to a remote device station by the master station.
●	●	●	○	There is no data addressed to the local station or the data addressed to the local station cannot be received because of noise. Communication speed setting does not match the master station setting.
●	●	●	●	Data cannot be received due to open-circuit fault, etc. in the communication cable. CC-Link compatible module is not set enabled. CC-Link compatible module is broken.
Others				An improbable state



CAUTION

Even if the LED display indicates that the communication is normal, data cannot be exchanged between the master station PLC and RCX controller unless data has been initialized correctly. Check whether data has been initialized by referring to Chapter 3.

3. Troubleshooting

If trouble occurs in the connection with the robot controller while starting up the CC-Link system or during operation, check the following items in listed order.

3-1 Robot controller front panel LED confirmation

3-2 Programming box error display confirmation

3-3 CC-Link compatible module LED confirmation

3-4 Confirmation from master station PLC

3.1 Robot controller front panel LED confirmation

[Confirmation item 1]

<Confirmation details>

- The "PWR" LED is OFF. (RCX240)
- The "RDY" LED is OFF. (RCX22x)

<Cause>

- Power is not being supplied to the robot controller.

<Countermeasures>

- Measure the voltage at the AC power input terminal of the power connector with a multimeter and check that the rated voltage is being supplied.

* Refer to the robot controller user's manual for the rated voltage for the robot controller.

[Confirmation item 2]

<Confirmation details>

- The "ERR" LED is ON.

<Cause>

- The robot controller is in emergency stop.
- A major error has occurred in the robot controller.

<Countermeasures>

- Confirm the error message displayed on the programming box.
- Take measures by following the troubleshooting section in the robot controller user's manual.

* Refer to the robot controller user's manual for details on the errors.

3.2 Programming box error display confirmation

[Confirmation item 1]

<Confirmation details>

- "CC-Link Communication Error" is displayed on the programming box.

<Cause>

- An error has occurred in the CC-Link system connection.

<Countermeasures>

- Check whether the CC-Link system cable is disconnected or incorrectly connected.
- Check the station No. and communication speed settings for the CC-Link compatible module.
- Confirm that the master station PLC is operating.

[Confirmation item 2]

<Confirmation details>

- Check whether an error other than "CC-Link Communication Error" is displayed on the programming box. **In this case, this problem is not related to the CC-Link system connection. Note, however, the message "CC-Link Communication Error" may not appear on the programming box if multiple errors have occurred simultaneously.**

<Cause>

- An error has occurred in the robot controller.

<Countermeasures>

- Check the error message displayed on the programming box.
- Check the error history using the programming box. Check the error history in the "SYSTEM > DIAGNOS > HISTORY" mode using the programming box.
- Take measures by following the troubleshooting section in the robot controller user's manual.

* Refer to the robot controller user's manual for details on the errors.

3.3 CC-Link compatible module LED confirmation

[Confirmation item 1]

<Confirmation details>

- The LED display on the CC-Link compatible module is not "RUN. ERR. SD. RD" = "○●○○".(○:ON, ●:OFF)

<Cause>

- An error has occurred in the CC-Link system connection. Refer to table in Chapter 4 section 2 for the meanings of the LED displays.

<Countermeasures>

- Check whether the CC-Link system cable is disconnected or incorrectly connected, and whether the terminator is connected.
- Check whether the CC-Link system cable is laid near the main circuit or power cable, or whether it is bundled with these.
- Check that the ferrite core is connected to the robot controller's power supply cable.
- Check the station No. and communication speed settings for the CC-Link compatible module.
- Check that the master station PLC is operating correctly.
- Check that the robot controller on the master station PLC is set to the remote device station.

[Confirmation item 2]

<Confirmation details>

- The LED display on the CC-Link compatible module is "RUN, ERR, SD, RD" = "●●○○".(○:ON, ●:OFF)

<Cause>

- The initial data process has not been executed when the CC-Link system was connected. Refer to Chapter 3.
- The RX(n+7)B (remote Ready) signal is not ON.

<Countermeasures>

- Carry out the initial data process when connecting to the CC-Link system.

3.4 Confirmation from master station PLC

[Confirmation item 1]

<Confirmation details>

- Using the master station PLC's line test function, confirm robot controller is correctly connected to the CC-Link system.

* Refer to the master station PLC instruction manual for details on the line test.

[Confirmation item 2]

<Confirmation details>

- Using the master station PLC's line test function, check whether an error has occurred in the robot controller's CC-Link connection.

<Cause>

- The ferrite core for noise measures is not connected.
- The CC-Link cable is laid near sources of noise such as the power cable.

<Countermeasures>

- Connect the ferrite core for noise measures onto the input power cable.
- Wire the CC-Link cable away from noise sources such as the power cable.

4. Error messages relating to CC-Link

This section describes error messages relating to CC-Link compatible units. For other messages, refer to robot controller user's manuals. When an error occurs, an error message appears on the message line (2nd line) of the MPB or RPB screen.

12.1 : Emg.stop on

Code	: &H0C01
Meaning/Cause	: a. MPB emergency stop button was pressed. b. Emergency stop terminals on SAFETY connector are open (emergency stop status). c. MPB or terminator is not connected to MPB connector. d. SAFETY connector is not connected. e. SI(00) is not ON. f. Error in connection to CC-Link system. g. RPB emergency stop button is pressed. h. RPB or terminator is not connected to PB connector.
Action	: 1. Release the MPB emergency stop button. 2. Close the emergency stop terminals on SAFETY connector. 3. Connect MPB or terminator to MPB connector. 4. Attach the SAFETY connector. 5. Set SI(00) to ON. 6. Correct the connection to CC-Link system. 7. Release the RPB emergency stop button. 8. Connect RPB or terminator to PB connector.

12.2 : Interlock on

Code	: &H0C02
Meaning/Cause	: a. Program was executed or moving of axis attempted with interlock signal still input. b. Interlock signal turned ON during execution of program or axis movement. c. DC24V is supplied to STD.DIO connector and DI(11) is not turned ON while using RCX240. d. SI(11) is not ON. e. Error in connection to CC-Link system. f. DI(11) is not turned ON while using RCX22x.
Action	: 1. Cancel the interlock signal, and execute program or move axis. 2. Set DI(11) on STD.DIO connector to ON. (RCX240) 3. Set SI(11) to ON. 4. When not using STD.DIO, disable (invalid) the "Watch on STD.DO DC24V" parameter in SYSTEM mode. (RCX240) 5. Correct the connection to CC-Link system. 6. Set DI(11) on SAFETY connector to ON. (RCX22x)

12.11 : CC-Link communication error

Code : &H0C0B

Meaning/Cause : a. Error in cable for CC-Link system.
b. Master station sequencer power is turned off or the operation has stopped.

Action : 1. Check for the cable and take measures to suppress noise on the controller.
2. Check if the master station sequencer is operating correctly.

12.12 : CC-Link overtime error

Code : &H0C0C

Meaning/Cause : a. Communication error in CC-Link system due noise, etc.
b. Master station sequencer power is turned off or the operation has stopped.

Action : 1. Take measures to suppress noise on the CC-Link system cable and controller.
2. Check if the master station sequencer is operating correctly.

12.70 : Incorrect option setting

Code : &H0C46

Meaning/Cause : a. Error in DIP switch setting on option unit.
b. Mismatched option units have been installed.
c. Cannot identify the installed option unit.

Action : 1. Check the DIP switch settings on the option unit.
2. Install the correct option units.
3. Replace the option unit.

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1. Profile

YAMAHA robot controller (4-station occupying)

■ Remote input/output

Remote → Master		Master → Remote	
Device No.	Signal name	Device No.	Signal name
RXn0	SO(00): Emergency stop input status output	RYn0	SI(00): Emergency stop input
RXn1	SO(01): CPU_OK status output	RYn1	SI(01): Servo ON input
RXn2	SO(02): Servo ON status output	RYn2	SI(02): Service mode input
RXn3	SO(03): Alarm status output	RYn3	SI(03): Step execution input *1
RXn4	System area [for future expansion]	RYn4	System area [for future expansion]
RXn5		RYn5	SI(05):IO command execution trigger input
RXn6		RYn6	System area [for future expansion]
RXn7		RYn7	
RXn8	SO(10): AUTO mode status output	RYn8	SI(10): Sequence control input
RXn9	SO(11): Return-to-origin complete status output	RYn9	SI(11): Interlock input
RXnA	SO(12): Sequence program execution status output	RYnA	SI(12): Robot program start input
RXnB	SO(13): Robot program execution status output	RYnB	SI(13): AUTO mode input
RXnC	SO(14): Program reset status output	RYnC	RCX141/221 SI(14): Absolute reset input *2
			RCX142/222 SI(14): Return-to-origin input *3
			RCX240 SI(14): Return-to-origin input
RXnD	SO(15): battery alarm output *1	RYnD	SI(15): Program reset input
RXnE	SO(16): IO command execution judgment output	RYnE	SI(16): MANUAL mode input
RXnF	SO(17): Output during IO command execution	RYnF	RCX141/221 SI(17): Return-to-origin input
			RCX142/222 SI(17): Absolute reset input
			RCX240 SI(17): Absolute reset / Return-to-origin input *4
RX(n+1)0	SO(20) to SO(27): General-purpose output	RY(n+1)0	SI(20) to SI(27): General-purpose input
to		to	
RX(n+1)7		RY(n+1)7	
RX(n+1)8	SO(30) to SO(37): General-purpose output	RY(n+1)8	SI(30) to SI(37): General-purpose input
to		to	
RX(n+1)F		RY(n+1)F	
RX(n+2)0	SO(40) to SO(47): General-purpose output	RY(n+2)0	SI(40) to SI(47): General-purpose input
to		to	
RX(n+2)7		RY(n+2)7	
RX(n+2)8	SO(50) to SO(57): General-purpose output	RY(n+2)8	SI(50) to SI(57): General-purpose input
to		to	
RX(n+2)F		RY(n+2)F	

(continued to next page)

Remote → Master		Master → Remote	
Device No.	Signal name	Device No.	Signal name
RX(n+3)0	SO(60) to SO(67): General-purpose output	RY(n+3)0	SI(60) to SI(67): General-purpose input
to RX(n+3)7		to RY(n+3)7	
RX(n+3)8	SO(70) to SO(77): General-purpose output	RY(n+3)8	SI(70) to SI(77): General-purpose input
to RX(n+3)F		to RY(n+3)F	
RX(n+4)0	SO(100) to SO(107): General-purpose output	RY(n+4)0	SI(100) to SI(107): General-purpose input
to RX(n+4)7		to RY(n+4)7	
RX(n+4)8	SO(110) to SO(117): General-purpose output	RY(n+4)8	SI(110) to SI(117): General-purpose input
to RX(n+4)F		to RY(n+4)F	
RX(n+5)0	SO(120) to SO(127): General-purpose output	RY(n+5)0	SI(120) to SI(127): General-purpose input
to RX(n+5)7		to RY(n+5)7	
RX(n+5)8	SO(130) to SO(137): General-purpose output	RY(n+5)8	SI(130) to SI(137): General-purpose input
to RX(n+5)F		to RY(n+5)F	
RX(n+6)0	SO(140) to SO(147): General-purpose output	RY(n+6)0	SI(140) to SI(147): General-purpose input
to RX(n+6)7		to RY(n+6)7	
RX(n+6)8	SO(150) to SO(157): General-purpose output	RY(n+6)8	SI(150) to SI(157): General-purpose input
to RX(n+6)F		to RY(n+6)F	
RX(n+7)0	Reserved	RY(n+7)0	Reserved
RX(n+7)1		RY(n+7)1	
RX(n+7)2		RY(n+7)2	
RX(n+7)3		RY(n+7)3	
RX(n+7)4		RY(n+7)4	
RX(n+7)5		RY(n+7)5	
RX(n+7)6		RY(n+7)6	
RX(n+7)7		RY(n+7)7	
RX(n+7)8	Initial data process request flag	RY(n+7)8	Initial data process complete flag
RX(n+7)9	Not used	RY(n+7)9	Not used
RX(n+7)A		RY(n+7)A	
RX(n+7)B	Remote ready	RY(n+7)B	Reserved
RX(n+7)C	Reserved	RY(n+7)C	
RX(n+7)D		RY(n+7)D	
RX(n+7)E	(Reserved: QnA)	RY(n+7)E	(Reserved: QnA)
RX(n+7)F		RY(n+7)F	

n: Address assigned to master module with station No. setting

*1: Step execution input (SI(03)) and battery alarm output (SO(15)) are only supported by the RCX22x.

*2: Used in YC-Link only when RCX141 or RCX221 is used with SR1-X.

*3: Used in YC-Link only when RCX142 or RCX222 is used with SR1-P.

*4: Used for "absolute reset" or "absolute reset / return-to-origin" depending on parameter (DI17 mode) setting.

Remote registers

Remote → Master			Master → Remote		
Device No.	Name		Device No.	Name	
RWr _n		Dedicated SOW(0)	RWw _n		Dedicated SIW(0)
RWr _(n+1)		Dedicated SOW(1)	RWw _(n+1)		Dedicated SIW(1)
RWr _(n+2)	General-purpose SOD(2)	General-purpose SOW(2)	RWw _(n+2)	General-purpose SID(2)	General-purpose SIW(2)
RWr _(n+3)		General-purpose SOW(3)	RWw _(n+3)		General-purpose SIW(3)
RWr _(n+4)	General-purpose SOD(4)	General-purpose SOW(4)	RWw _(n+4)	General-purpose SID(4)	General-purpose SIW(4)
RWr _(n+5)		General-purpose SOW(5)	RWw _(n+5)		General-purpose SIW(5)
RWr _(n+6)	General-purpose SOD(6)	General-purpose SOW(6)	RWw _(n+6)	General-purpose SID(6)	General-purpose SIW(6)
RWr _(n+7)		General-purpose SOW(7)	RWw _(n+7)		General-purpose SIW(7)
RWr _(n+8)	General-purpose SOD(8)	General-purpose SOW(8)	RWw _(n+8)	General-purpose SID(8)	General-purpose SIW(8)
RWr _(n+9)		General-purpose SOW(9)	RWw _(n+9)		General-purpose SIW(9)
RWr _(n+10)	General-purpose SOD(10)	General-purpose SOW(10)	RWw _(n+10)	General-purpose SID(10)	General-purpose SIW(10)
RWr _(n+11)		General-purpose SOW(11)	RWw _(n+11)		General-purpose SIW(11)
RWr _(n+12)	General-purpose SOD(12)	General-purpose SOW(12)	RWw _(n+12)	General-purpose SID(12)	General-purpose SIW(12)
RWr _(n+13)		General-purpose SOW(13)	RWw _(n+13)		General-purpose SIW(13)
RWr _(n+14)	General-purpose SOD(14)	General-purpose SOW(14)	RWw _(n+14)	General-purpose SID(14)	General-purpose SIW(14)
RWr _(n+15)		General-purpose SOW(15)	RWw _(n+15)		General-purpose SIW(15)

n: Address assigned to master module with station No. setting

2. Details of remote input/output signals

■ Remote input (RX)

Device No.	Signal name	Details
RXn0	SO(00): Emergency stop input status output	Turns ON when robot controller is in emergency stop state.
RXn1	SO(01): CPU_OK status output	Turns ON when robot controller is in normal state.
RXn2	SO(02): Servo ON status output	Turns ON when robot controller motor power is ON.
RXn3	SO(03): Alarm status output	Turns ON when robot controller is in following state: • Serious error occurred in robot controller. • Emergency stop input OFF
RXn8	SO(10): AUTO mode status output	Turns ON when selected mode is AUTO mode. Turns OFF when other mode is selected.
RXn9	SO(11): Return-to-origin complete status output	Turns ON when robot has completed return-to-origin.
RXnA	SO(12): Sequence program execution status output	Turns ON while sequence program is executed.
RXnB	SO(13): Robot program execution status output	Turns ON while robot program is executed.
RXnC	SO(14): Program reset status output	Turns ON when robot program has been reset. Turns OFF when robot program starts.
RXnD	SO(15): Battery alarm output	Turns ON when the system backup battery (RCX22x) or absolute battery (RCX222) is low.
RXnE	SO(16): IO command execution judgment output	Turns OFF while executing the IO command. After executing the IO command turns ON if normal, and stays OFF if abnormal.
RXnF	SO(17): Output during IO command execution	Turns ON while the IO command is being executed.
RX(n+1)0 to RX(n+1)7	SO(20) to SO(27): General-purpose output	General-purpose output turns ON/OFF when value is substituted to SO port, or SET/RESET command is executed or OUT command is executed.
to	to	
RX(n+6)8 to RX(n+6)F	SO(150) to SO(157): General-purpose output	
RX(n+7)8	Initial data process request flag	The initial data process request flag turns ON to request the initial data setting when the power is turned ON, or when returning from a communication error. Turns OFF when initial data process is completed (initial data process complete flag RY(n+7)8 turns ON).
RX(n+7)B	Remote ready	Turns ON when initial data setting is completed and READY state is entered when power is turned ON or when returning from communication error.

n: Address assigned to master module with station No. setting



NOTE

- Battery alarm output (SO(15)) is only supported by the RCX22x.
- In controllers using the following software versions, the area check outputs can be assigned to general-purpose outputs SO(20) to SO(157) when the area check output function is used.
RCX240: Ver. 10.10 or later, RCX22x: Ver. 9.22 or later
In controllers whose software version is earlier than the above, the area check outputs can be assigned to general-purpose outputs SO(20) to SO(24).

■ Remote output (RY)

Device No.	Signal name		Details
RYn0	SI(00): Emergency stop input		Turn OFF to trigger emergency stop on controller. Keep turned ON during normal operation.
RYn1	SI(01): Servo ON input		Turn ON to cancel emergency stop and turn ON the robot servo motor. Servo-ON is executed when this input is switched from OFF to ON. Emergency stop input [SI(00)] (RYn0) must be ON and emergency stop conditions in the robot controller (emergency stop terminal of SAFETY connector, etc.) must be canceled.
RYn2	SI(02): Service mode input		Turn OFF to enter the controller in service mode. Keep turned ON during normal operation. (Effective only when SAFE mode is enabled.) (In SAFE mode enabled, dedicated input might be disabled depending on service mode parameter setting.)
RYn3	SI(03): Step execution input		Turn ON to execute a step in the program during AUTO mode. One line of the program is executed when this input is changed from OFF to ON.
RYn5	SI(05): IO command execution trigger input		Turn from OFF to ON to execute IO command. Always turn ON after IO command is set to general-purpose input.
RYn8	SI(10): Sequence control input		Turn ON to execute sequence program in the robot controller. Sequence program is executed when this input is ON.
RYn9	SI(11): Interlock input		Turn OFF to stop execution of robot program. Keep turned ON to continue program execution.
RYnA	SI(12): Robot program start input		Turn ON to execute robot program. Robot program is executed when this input is switched from OFF to ON. Robot controller must be in AUTO mode.
RYnB	SI(13): AUTO mode input		Turn ON to select AUTO mode. Robot program enters AUTO mode when this input is switched from OFF to ON.
RYnC	RCX141/221	SI(14): Absolute reset input * For YC-Link where RCX141/221 is used with SR1-X	Turn ON to perform absolute reset of robot. Absolute reset is performed when this input is switched from OFF to ON, except for axes that use mark method for return-to-origin. Absolute reset cannot be performed by dedicated input if return-to-origin is incomplete on axes that use mark method. Robot controller mode must be in MANUAL mode.
	RCX142/222	SI(14): Return-to-origin input * For YC-Link where RCX142/222 is used with SR1-P	Turn ON to perform return-to-origin on incremental type axes or semi-absolute type axes. When this input is switched from OFF to ON, return-to-origin is performed on incremental type axes or absolute search is performed on semi-absolute type axes.
	RCX240	SI(14): Return-to-origin input	This input is for axes whose return-to-origin method is sensor or stroke-end (torque detection) method. Robot controller mode must be in MANUAL mode.
RYnD	SI(15): Program reset input		Turn ON to reset robot program. Program reset is executed when this input is switched from OFF to ON. Robot controller must be in AUTO mode.
RYnE	SI(16): MANUAL mode input		Turn ON to select MANUAL mode. Robot program enters MANUAL mode when this input is switched from OFF to ON.

(continued to next page)

n: Address assigned to master module with station No. setting

2. Details of remote input/output signals

Device No.	Signal name		Details
RYnF	RCX141/221	SI(17): Return-to-origin input	Turn ON to perform return-to-origin on incremental type axes or semi-absolute type axes. When this input is switched from OFF to ON, return-to-origin is performed on incremental type axes or absolute search is performed on semi-absolute type axes. This input is for axes whose return-to-origin method is sensor or stroke-end (torque detection) method. Robot controller mode must be in MANUAL mode.
	RCX142/222	SI(17): Absolute reset input	Turn ON to perform absolute reset of robot. Absolute reset is performed when this input is switched from OFF to ON, except for axes that use mark method for return-to-origin. Absolute reset cannot be performed by dedicated input if return-to-origin is incomplete on axes that use mark method. Robot controller mode must be in MANUAL mode.
	RCX240	SI(17): Absolute reset / Return-to-origin input	Used for "absolute reset" or "absolute reset / return-to-origin" depending on parameter (DI17 mode) setting. - When set to "ABS" (absolute reset) Turn ON to perform absolute reset of robot. Absolute reset is performed when this input is switched from OFF to ON, except for axes that use mark method for return-to-origin. Absolute reset cannot be performed by dedicated input if return-to-origin is incomplete on axes that use mark method. Robot controller mode must be in MANUAL mode. - When set to "ABS/ORG" (absolute reset / return-to-origin) When only absolute type axes are used, switching this input from OFF to ON performs absolute reset. When only incremental type and semi-absolute type axes are used, switching this input from OFF to ON performs return-to-origin on the incremental axes and absolute search on the semi-absolute type axes. When absolute type, incremental type and semi-absolute type axes are used, absolute reset is first performed on the absolute axes and then return-to-origin is performed on the incremental type and semi-absolute type axes.
	RY(n+1)0 to RY(n+1)7	SI(20) to SI(27): General-purpose input	Use ON/OFF of these general-purpose inputs for referencing the SI port value and executing a WAIT command.
	to	to	
RY(n+6)8 to RY(n+6)F	SI(150) to SI(157): General-purpose input		
RY(n+7)8	Initial data process complete flag		Turns ON when power is turned ON, communication error is reset, or data initialization is requested or completed. Emergency stop input (RYn0) and interlock input (RYn9) are turned ON when data is initialized.

n: Address assigned to master module with station No. setting



NOTE

- Step execution input (SI(03)) is only supported by the RCX22x.
- When using SI(17) as return-to-origin input with the RCX240 which is used as a replacement for the RCX141 or RCX221, use SI(17) as "absolute reset / return-to-origin".
- When the RCX240 is used with a robot whose axis configuration includes absolute type, incremental type and/or semi-absolute type axes, and if SI(17) is used for "absolute reset / return-to-origin", then absolute reset is performed on the absolute reset axis each time return-to-origin is performed on the incremental type and/or semi-absolute type axes. So, if the robot axis configuration includes absolute type, incremental type and/or semi-absolute type axes, we recommend using SI (17) to perform absolute reset and SI(14) to perform return-to-origin.
- Return-to-origin input and absolute reset input can also be executed in AUTO mode by changing the execution level. Refer to the controller user's manual for more details.

2. Details of remote input/output signals

■ Remote registers (RWw)

Device No.		Name	Details
RWwn		Dedicated SIW(0)	Used as the remote command area.
RWw(n+1)		Dedicated SIW(1)	Used as the remote command's command data area.
RWw(n+2)	General-purpose SID(2)	General-purpose SIW(2)	Used to input word or double word data from SIW or SID port. Or, used as remote command's command data area.
RWw(n+3)		General-purpose SIW(3)	
RWw(n+4)	General-purpose SID(4)	General-purpose SIW(4)	
RWw(n+5)		General-purpose SIW(5)	
RWw(n+6)	General-purpose SID(6)	General-purpose SIW(6)	
RWw(n+7)		General-purpose SIW(7)	
RWw(n+8)	General-purpose SID(8)	General-purpose SIW(8)	
RWw(n+9)		General-purpose SIW(9)	
RWw(n+10)	General-purpose SID(10)	General-purpose SIW(10)	
RWw(n+11)		General-purpose SIW(11)	
RWw(n+12)	General-purpose SID(12)	General-purpose SIW(12)	
RWw(n+13)		General-purpose SIW(13)	
RWw(n+14)	General-purpose SID(14)	General-purpose SIW(14)	
RWw(n+15)		General-purpose SIW(15)	

n: Address assigned to master module with station No. setting

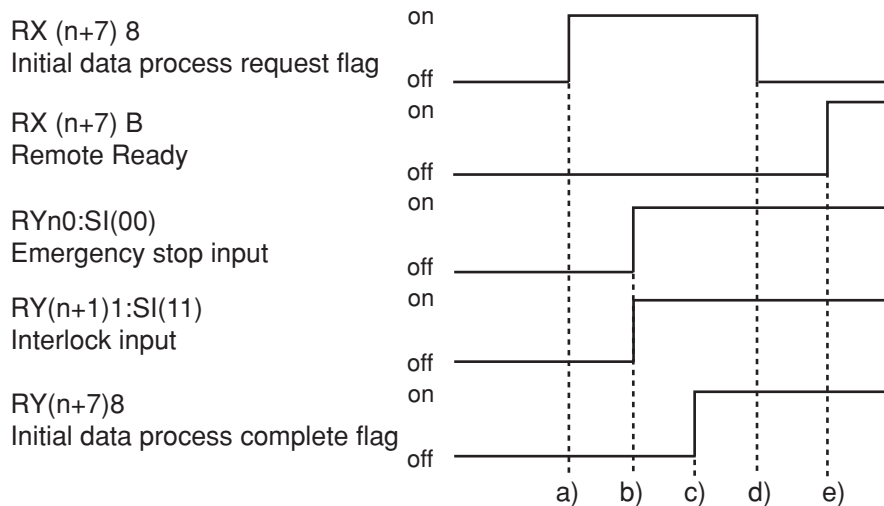
■ Remote registers (RWr)

Device No.		Name	Details
RWrn		Dedicated SOW(0)	Used as remote command's status area.
RWr(n+1)		Dedicated SOW(1)	Used as remote command's error code area.
RWr(n+2)	General-purpose SOD(2)	General-purpose SOW(2)	Used to output word or double word data from SOW or SOD port. Or, used as remote command's response area.
RWr(n+3)		General-purpose SOW(3)	
RWr(n+4)	General-purpose SOD(4)	General-purpose SOW(4)	
RWr(n+5)		General-purpose SOW(5)	
RWr(n+6)	General-purpose SOD(6)	General-purpose SOW(6)	
RWr(n+7)		General-purpose SOW(7)	
RWr(n+8)	General-purpose SOD(8)	General-purpose SOW(8)	
RWr(n+9)		General-purpose SOW(9)	
RWr(n+10)	General-purpose SOD(10)	General-purpose SOW(10)	
RWr(n+11)		General-purpose SOW(11)	
RWr(n+12)	General-purpose SOD(12)	General-purpose SOW(12)	
RWr(n+13)		General-purpose SOW(13)	
RWr(n+14)	General-purpose SOD(14)	General-purpose SOW(14)	
RWr(n+15)		General-purpose SOW(15)	

n: Address assigned to master module with station No. setting

3. Dedicated input/output signal timing chart

3.1 Initial data process for CC-Link connection



CAUTION

- The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)
- If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.

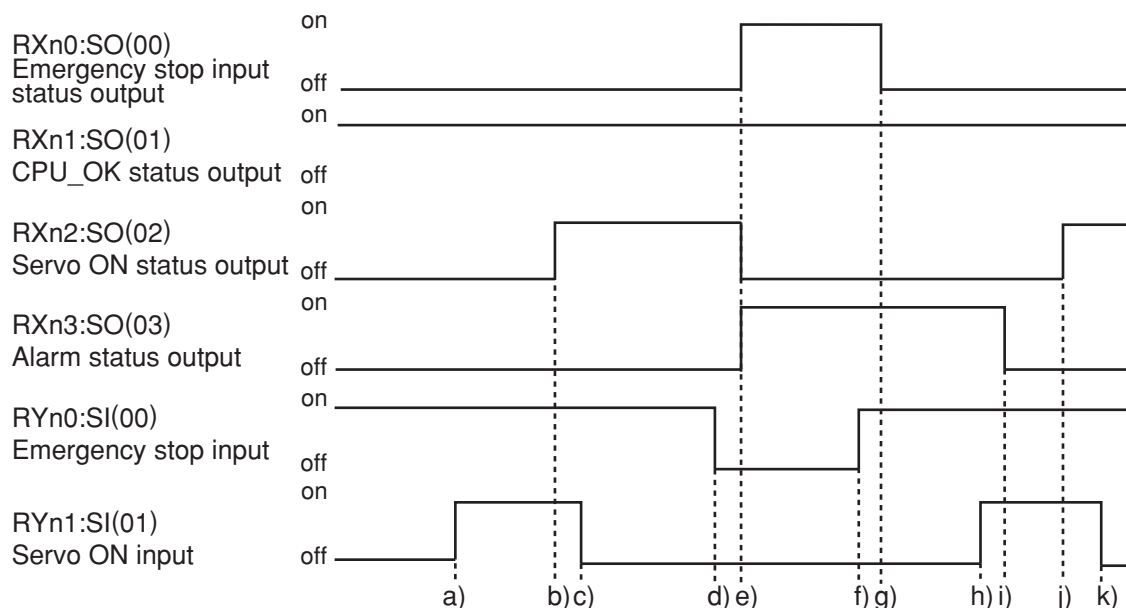
Confirmation of connection with master station PLC at power ON

- Initial data process request flag ON is output
- Emergency stop and interlock input ON is input
- Initial data process complete flag ON is input
- Initial data process request flag OFF is output
- Remote Ready ON is output

Connection with the CC-Link system is completed with this process.

- * This process is always required to correctly connect to the CC-Link system.
- * To enter the emergency stop state, turn RYn0:SI(00) OFF after the above process is established.
- * The servo is OFF when the controller power is turned ON.

3.2 Servo ON and emergency stop



CAUTION

- The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)
- If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.

Initial servo ON process after power ON

- Servo ON input ON is input
- If not in the emergency stop state, output servo ON status ON is output
- After confirming that servo ON status output is ON, servo ON input OFF is input

Shift to emergency stop

- Emergency stop input OFF is input
- Emergency stop input status and alarm status output ON are output
Servo ON status output OFF is output

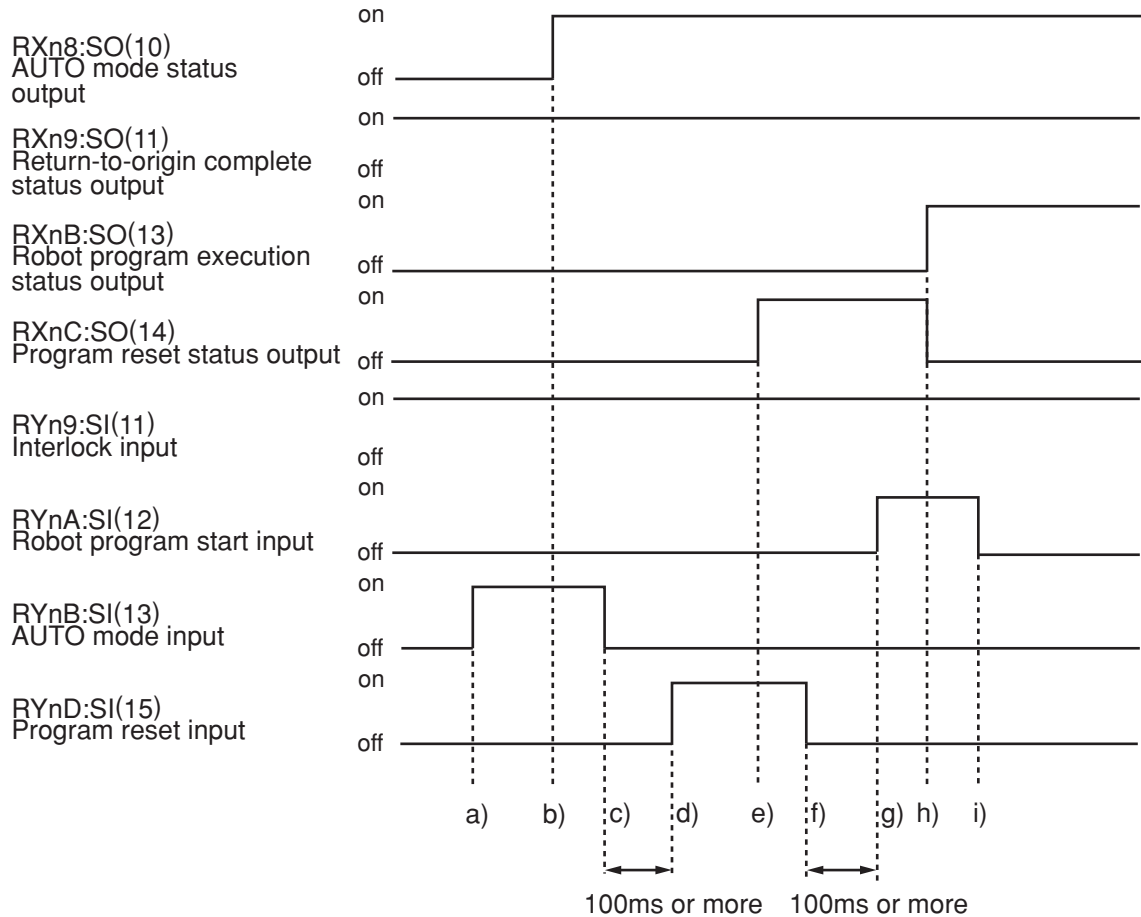
Servo ON process from emergency stop status

- Emergency stop input ON is input
- Emergency stop input status output OFF is output
- Servo ON input ON is input
- Alarm status output OFF is output
- Servo ON status output ON is output
- After confirming that servo ON status output is ON, servo ON input OFF is input

* The servo is OFF when the controller power is turned ON.

- * When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

3.3 AUTO mode changeover, program reset and program execution



CAUTION

- The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)
- If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.

AUTO mode changeover process

- AUTO mode input ON is input
- AUTO mode status output ON is output
- After confirming that the AUTO mode status output is ON, the AUTO mode input OFF is input

Program reset process

- Program reset input ON is input

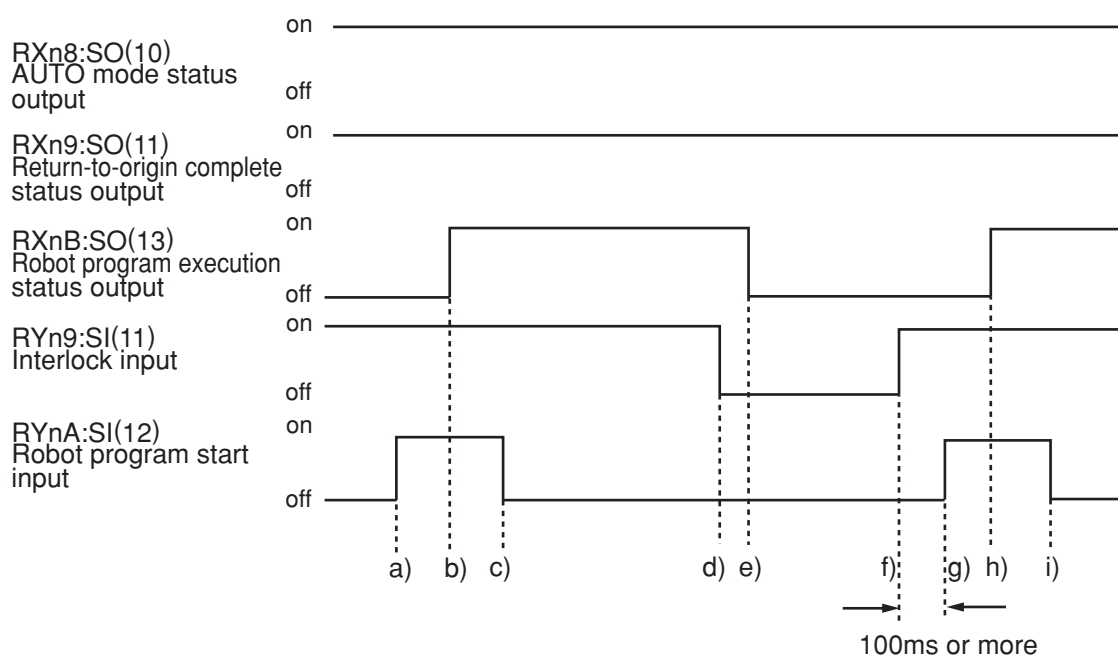
3. Dedicated input/output signal timing chart

- e) Program reset status output ON is output
- f) After confirming that the program reset status output is ON, the program reset input OFF is input

Program execution process

- g) Robot program start input ON is input
 - h) Program reset status output OFF is output
Robot program execution status output ON is output
 - i) After confirming that the robot program execution status output is ON, the robot program start input OFF is input
- * The program cannot be executed if the emergency stop input and interlock input are OFF.
 - * If the return-to-origin complete status output is not ON, execution of the program may not be possible depending on the execution level setting value.
 - * When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

3.4 Stopping with program interlock



CAUTION

- The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)
- If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.

Program execution process

- a) Robot program start input ON is input
- b) Robot program execution status output ON is output
- c) After confirming that the robot program execution status output is ON, the start input OFF is input

Program stop process using interlock input

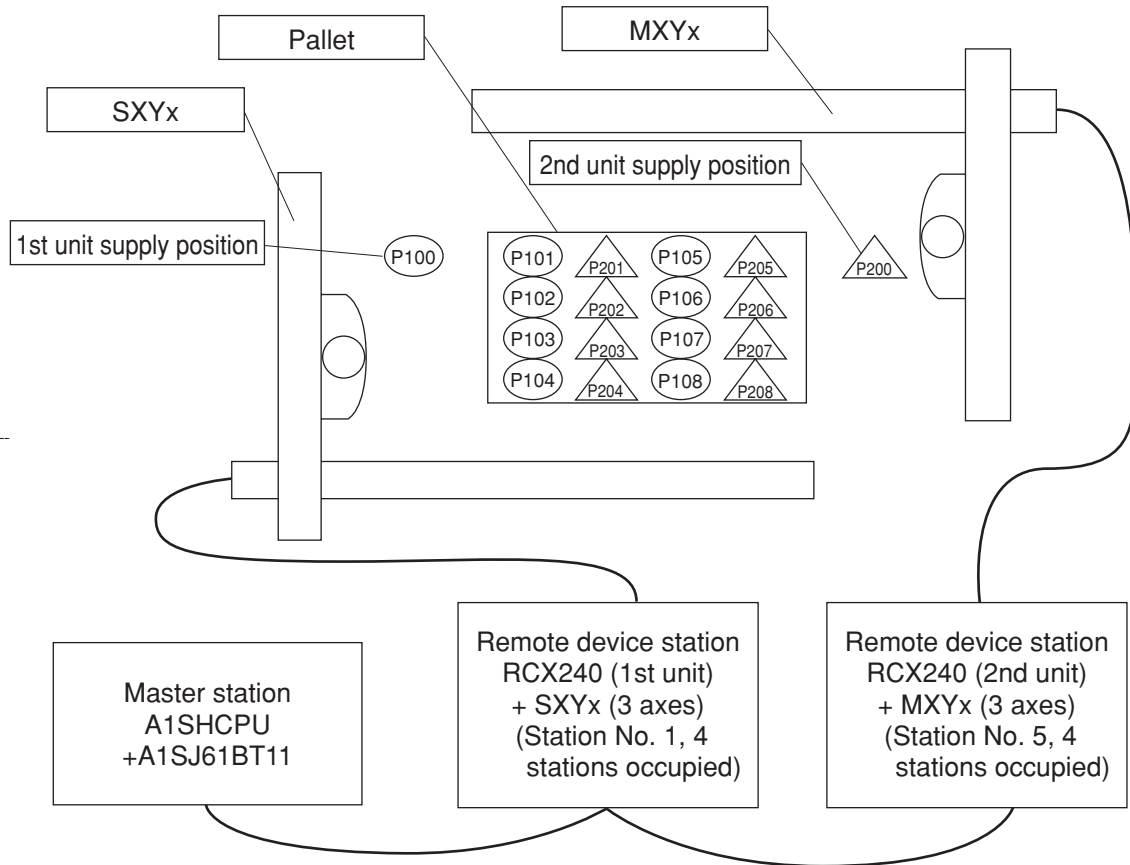
- d) Interlock input OFF is input
- e) Robot program execution status output OFF is output

Program execution after stopping program with interlock input

- f) Interlock input ON is input
 - g) Robot program start input ON is input
 - h) Robot program execution status output ON is output
 - i) After confirming that the robot program execution status output is ON, the start input OFF is input
- * The program will also stop when the emergency stop input OFF is input. In this case, the emergency stop input status and alarm status output ON will be output, and the servo ON status output OFF will be output. The servo ON process is required to start the program again.
- * When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

4. Sample program

An example for the following type of hardware configuration has been prepared for this section.



[Details of sample]

- Pick & place work is carried out using the PLC and RCX240 + SXYx (3 axes), RCX240+MXYx (3 axes).
 - The workpieces supplied to each robot are arranged on one pallet.
 - The workpiece is supplied at a rate faster than the robot operation.
 - The two robots will interfere above the pallet, so data is exchanged to prevent interference.
 - When handling the workpiece, the robot moves at a low speed.
 - The robot controller directly exchanges the pallet.
- * Refer to the robot programming manual for details on the robot program language.
- * The PLC circuit is a simple circuit that executes the selected robot program when emergency stop is canceled.

[Robot program data assignment]*** Variables used**

1st unit : A : Point No. in pallet
 2nd unit : B : Point No. in pallet

*** Points used**

1st unit : P100 : Point above workpiece supply
 P101 : 1st point above pallet
 : :
 P108 : 8th point above pallet
 P121 : Z axis position point for workpiece supply
 P122 : Z axis position point on pallet
 2nd unit : P200 : Point above workpiece supply
 P201 : 1st point above pallet
 : :
 P208 : 8th point above pallet
 P221 : Z axis position point for workpiece supply
 P222 : Z axis position point on pallet

*** Bit information used**

1st unit : SI (40) : Point No. reception complete input
 SI (41) : Movement complete response standby input
 SI (42) : Movement complete standby input
 SO (23) to SO (20) : Point No. setting output group
 SO (40) : Point No. setting complete output
 SO (41) : Movement complete output
 SO (42) : Movement complete response output
 DI (47) : Pallet change complete input
 DO (40) : Chuck hand open close (0: Close, 1: Open)
 DO (47) : Pallet exchange command output
 2nd unit : SI (23) to SI (20) : Point No. setting input group
 SI (40) : Point No. transmission complete input
 SI (41) : Movement complete standby input
 SI (42) : Movement complete response standby input
 SO (40) : Point No. setting reception complete output
 SO (41) : Movement complete response output
 SO (42) : Movement complete output
 DO (40) : Chuck hand open/close (0: Close, 1: Open)

[PLC data assignment]

X0 (*1)	: Unit error
X1 (*1)	: Local station data link status
X6 (*1)	: Data link start normal completion
X7 (*1)	: Data link start error completion
X0F (*1)	: Unit ready
X100	: 1st unit's SO(00): Emergency stop input status
X101	: 1st unit's SO(01): CPU_OK
:	:
X17F	: 1st unit reservation
X180	: 2nd unit's SO(00): Emergency stop input status
X181	: 2nd unit's SO(01): CPU_OK
:	:
X1FF	: 2nd unit reservation
Y0 (*1)	: Refresh instruction
Y6 (*1)	: Data link start request
Y100	: 1st unit's SI(00): Emergency stop input
Y101	: 1st unit's SI(01): Servo ON input
:	:
Y17F	: 1st unit reservation
Y180	: 2nd unit's SI(00): Emergency stop input
Y181	: 2nd unit's SI(01): Servo ON input
:	:
Y1FF	: 2nd unit reservation
M0	: Unit preparation complete flag
M1	: Parameter setting flag
M2	: Data link start flag
M4	: 1st station data link status
M8	: 5th station data link status
D0	: No. of connection units storage device
D1	: 1st unit local station information setting storage device
D2	: 2nd unit local station information setting storage device
D10	: Parameter setting status storage device

*1: This number is determined by the master module mounting position and the number of occupied input/output points mounted before the module.

[Robot program]**1st unit's RCX240**

```

'INIT ROUTINE
  RESET SO2()
  RESET SO4()
  RESET DO4()
  A=101
'MAIN ROUTINE
  MOVE P,P100,Z=0
  GOSUB *PICK
*ST1:
  MOVE P,P[A],Z=0
  GOSUB *PLACE
  MOVE P,P100,Z=0
  SO(41)=1
  WAIT SI(41)=1
  SO(41)=0
  WAIT SI(41)=0
  SO(23,22,21,20)=A-100
  SO(40)=1
  WAIT SI(40)=1
  SO(40)=0
  WAIT SI(40)=0
  SO(23,22,21,20)=0
  GOSUB *PICK
  WAIT SI(42)=1
  SO(42)=1
  WAIT SI(42)=0
  SO(42)=0
  A=A+1
  IF A>108 THEN
    A=101
    DO(47)=1
    WAIT DI(47)=1
    DO(47)=0
  ENDIF
  GOTO *ST1
  HALT
'SUB ROUTINE FOR PICK
*PICK:
  DO(40)=1
  DRIVE(3,P121),S=20
  WAIT ARM(3)
  DO(40)=0
  DELAY 500
  RETURN
'SUB ROUTINE FOR PLACE
*PLACE:
  DRIVE(3,P122),S=20
  WAIT ARM(3)
  DO(40)=1
  DELAY 500
  RETURN

```

2nd unit's RCX240

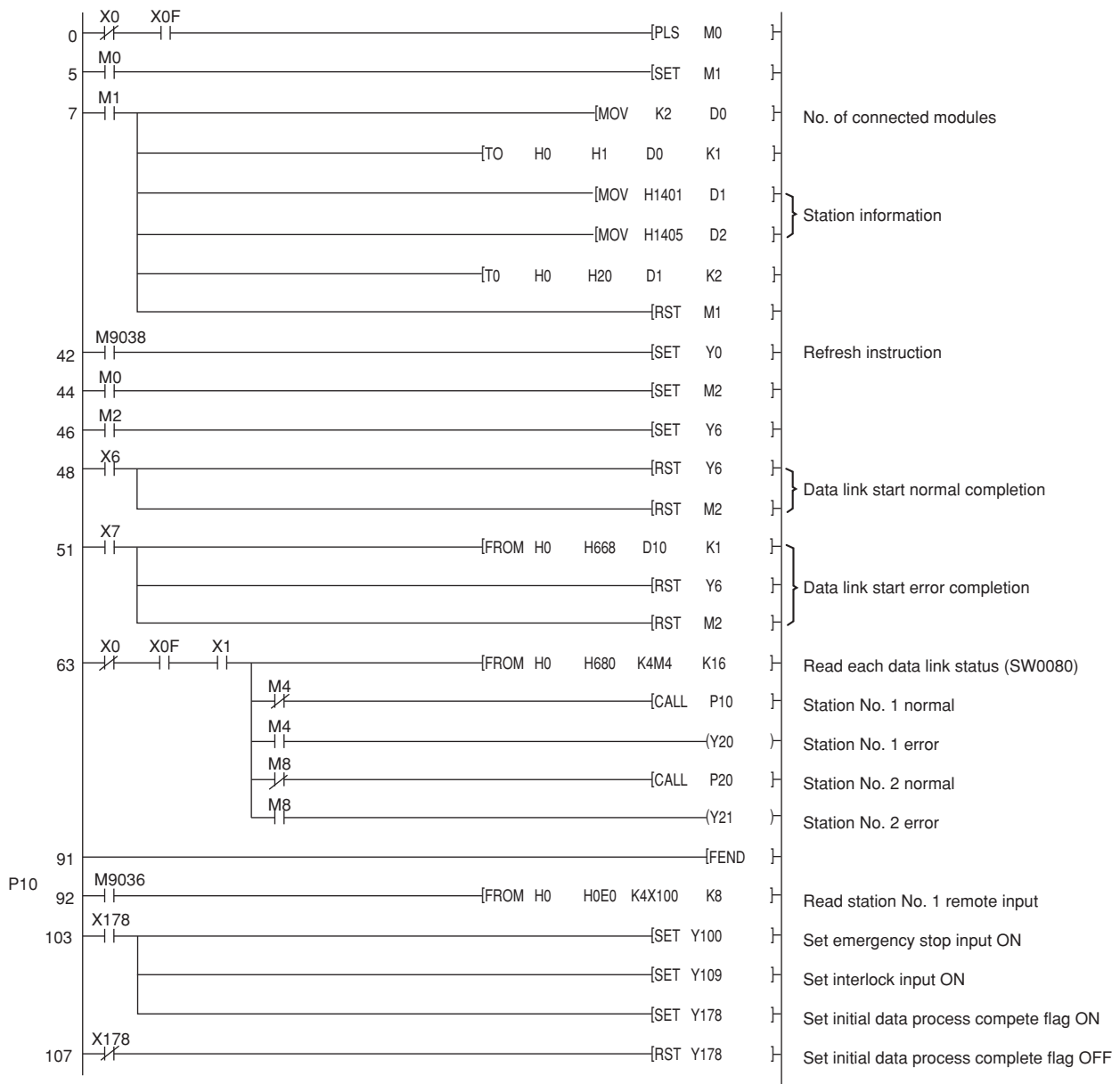
```

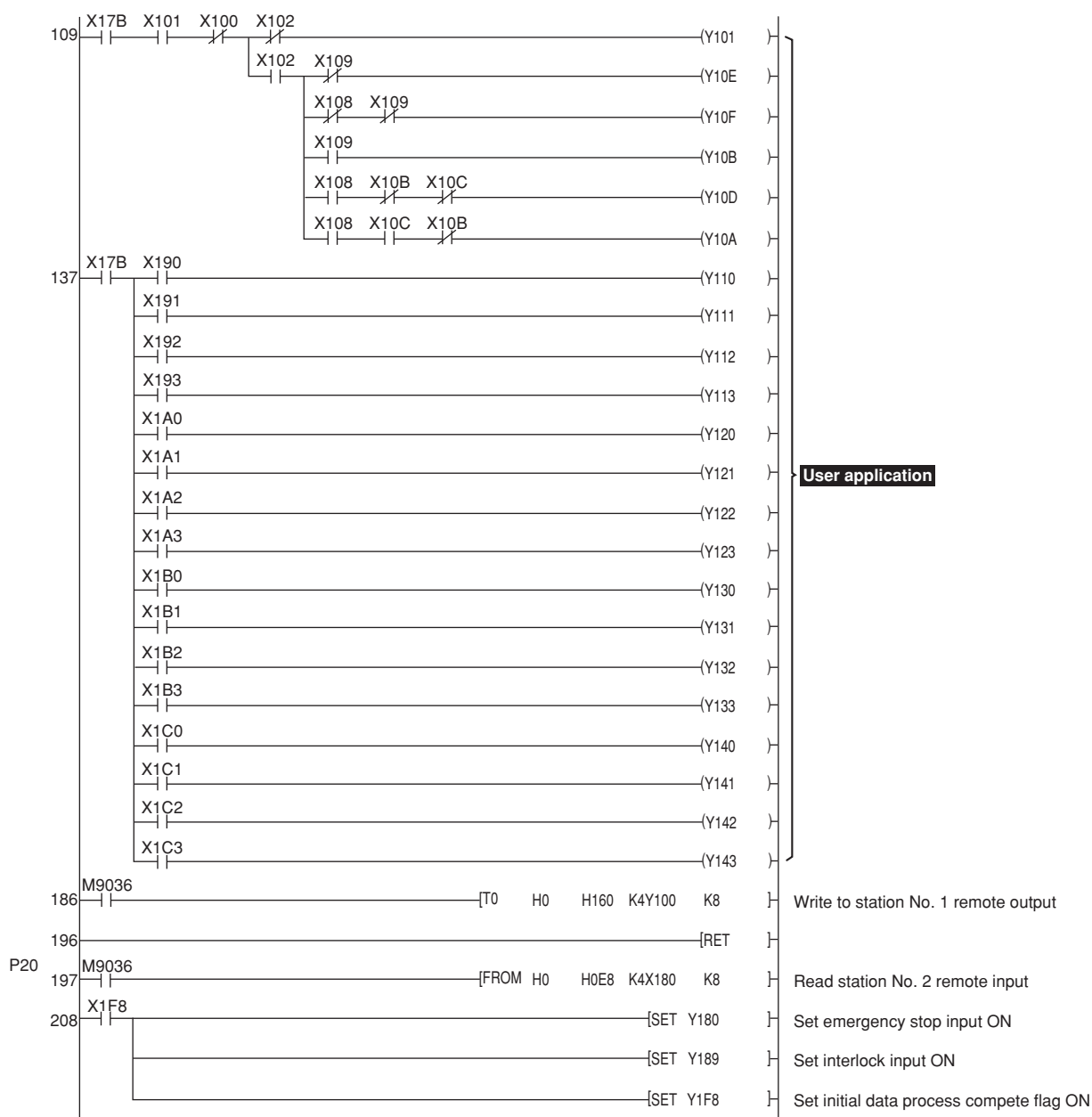
'INIT ROUTINE
  RESET SO2()
  RESET SO4()
  RESET DO4()
  B=201
'MAIN ROUTINE
  MOVE P,P200,Z=0
  GOSUB *PICK
*ST2:
  WAIT SI(41)=1
  SO(41)=1
  WAIT SI(41)=0
  SO(41)=0
  WAIT SI(40)=1
  B=SI(23,22,21,20)
  SO(40)=1
  WAIT SI(40)=0
  SO(40)=0
  B=B+200
  MOVE P,P[B],Z=0
  GOSUB *PLACE
  MOVE P,P200,Z=0
  SO(42)=1
  WAIT SI(42)=1
  SO(42)=0
  WAIT SI(42)=0
  GOSUB *PICK
  GOTO *ST2
  HALT
'SUB ROUTINE FOR PICK
*PICK:
  DO(40)=1
  DRIVE(3,P221),S=20
  WAIT ARM(3)
  DO(40)=0
  DELAY 500
  RETURN
'SUB ROUTINE FOR PLACE
*PLACE:
  DRIVE(3,P222),S=20
  WAIT ARM(3)
  DO(40)=1
  DELAY 500
  RETURN

```

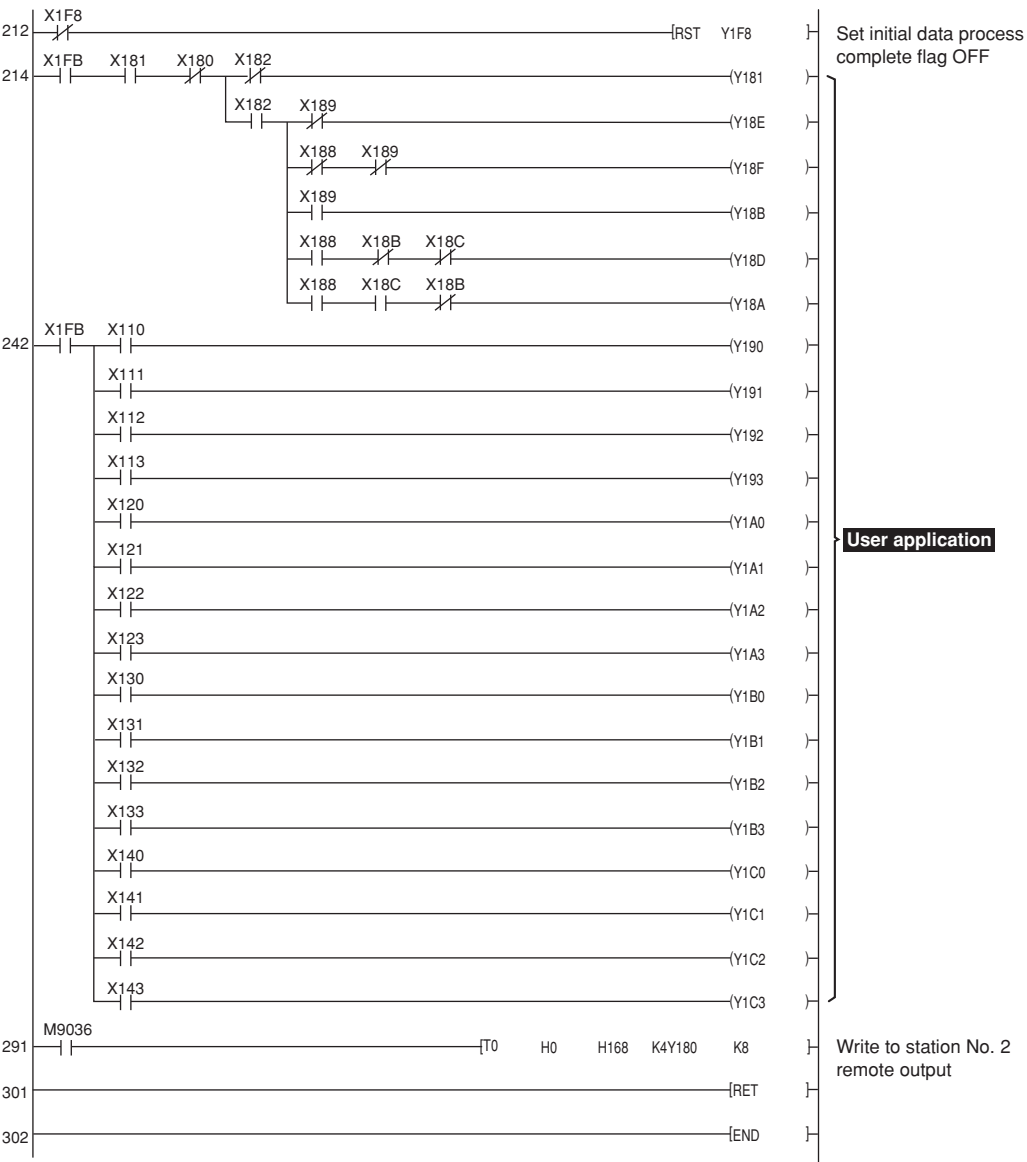
4. Sample program

[PLC program]





4. Sample program



5. CC-Link compatible module specifications

The CC-Link compatible module with the label is compatible with CC-Link Ver. 1.10. Limits on the station-to-station cable length, etc., can be eased by using the Ver. 1.10 compatible CC-Link cable. Refer to the master station PLC instruction manual compatible with Ver. 1.10.

Specification item	CC-Link compatible module	
Target controller	RCX series controller	
Remote station type	Remote device station	
Number of occupied stations	Fixed to four stations	
Station No. setting	1 to 61 (rotary switch)	
Communication speed setting	10M / 5M / 2.5M / 625K / 156Kbps (rotary switch)	
Number of CC-Link input/output points *1)	Remote input/output	Dedicated input : 16 points
		General-purpose input : 96 points
	Remote register	Dedicated output : 16 points
		General-purpose output : 96 points
	Remote register	Dedicated input : 2 words
		General-purpose input : 14 words
		Dedicated output : 2 words
		General-purpose output : 14 words
Monitor LED	RUN, ERRL, SD, RD	

*1) Controller's I/O update intervals are 10ms at shortest, but actual I/O update intervals change depending on the update time for the master station.



CAUTION

- For the names and description of remote input/output signals and remote registers, refer to the tables shown in "1. Profile" and "2. Details of remote input/output signals" in this chapter.
- The specifications and appearance are subject to change without prior notice.

MEMO

Contents

1. Term definition	6-1
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1. Term definition

1. CC-Link (Control & Communication Link)

CC-Link is a registered trademark of CC-Link partner association.

2. SAFE mode setting

When the SAFE mode setting is enabled, service mode input is made valid so that safety functions such as operating speed limits in MANUAL mode can be used. The SAFE mode setting is determined at the time of shipping. The SAFE mode setting is always enabled for controllers compatible with CE marking.

3. SERVICE mode

This mode is valid only when the SAFE mode setting is enabled, and can be controlled by service mode input signals.

4. SAFETY connector

This connector is used to connect emergency stop input and service mode input. Located on the front panel of the robot controller.

5. STD. DIO connector

This connector is used to receive or output dedicated I/O signals and general-purpose I/O signals. Located on the front panel of the robot controller.

6. bit information

Bit data transmitted and received between master station PLC and controller.

7. Word information

Word data transmitted and received between master station PLC and controller.

8. Little endian

Method to substitute LSB in low-order address and refer to LSB when handling word information data as double word data. For example, when the value 00012345h is substituted in SOD (2), 2345h is substituted in SOW (2) of the first word, and 0001h is substituted in SOW (3) of the second word.

Revision record

Manual version	Issue date	Description
Ver. 1.07	Jun. 2007	Modification of the table of LED display. Addition of description regarding enable/disable for the dedicated input of STD.DIO on RCX22 series. Clerical error corrections, etc.
Ver. 1.08	Sep. 2007	Addition of descriptions regarding semi-absolute type axes. Clerical error corrections, etc.
Ver. 1.09	Aug. 2009	Addition of descriptions regarding RCX240 to SI(17), SI(14) in Chapter 5 "1. Profile". Wording of controller name was changed.
Ver. 1.10	May 2011	The description regarding "Warranty" was changed.
Ver. 1.11	Jul. 2012	The description regarding "Warranty" was changed. Clerical error corrections.

User's Manual

YAMAHA RCX series
Robot Controller **CC-Link**
network board

Jul. 2012

Ver. 1.11

This manual is based on Ver. 1.11 of Japanese manual.

YAMAHA MOTOR CO., LTD. IM Operations

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